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Foreword

The OECD Review of Kuwait's Innovation Policy is part of a series of OECD country reviews of innovation policy (www.oecd.org/sti/innovation/reviews). It was requested, and entirely funded, by the authorities of Kuwait, represented by the Kuwait Foundation for the Advancement of Science (KFAS) and the General Secretariat of the Supreme Council for Planning and Development (SCPD), and was carried out by the OECD Directorate for Science, Technology and Innovation.

The purpose of the review is to obtain a solid understanding of the key elements, relationships and dynamics which drive the Kuwaiti national innovation system and the opportunities to enhance it through government policy. More specifically, the review:

- provides an independent systemic assessment of the overall performance of the Kuwaiti National Innovation System (NIS) with an international comparative perspective;
- analyses the improvements that can be made within the Kuwait national innovation system, taking into account the country's goals, resources and specific constraints;
- formulates recommendations on how government policies could contribute to such improvements, drawing on the experience of OECD members, and other economies of interest for this exercise.

The review is relevant to a wide range of other stakeholders, including government policy makers, business decision makers, the research community, the civil society and the general public.

Intermediary findings were discussed and feedback was received from various stakeholders in Kuwait, at different stages of the project execution, including the KFAS Board of Directors and Steering Committee, and the General Secretariat of the SCPD.

A preliminary draft assessment and recommendations of areas for improvement were discussed during an informal Expert Meeting in December 2019. The meeting, chaired by Göran Marklund, OECD Working Party for Innovation and Technology policies (TIP) and Deputy Director General of VINNOVA, Sweden, saw the participation of the Ambassador of Kuwait to France, Mohammad Al-Suleiman, the Director-General of KFAS, Adnan Shihab-Eldin, and the Secretary General of the SCPD, Khaled Mahdi. Fifteen TIP delegates attended and Finland representative Kai Husso, Chief Planning Officer, Innovation and Enterprise Financing Department / Business Intelligence, Ministry of Economic Affairs and Employment of Finland, and Malaysia delegate Mohd Zakwan Mohd Zabidi, Senior Vice President, Malaysian Industry Government Group for High Technology, Special Officer to the Science Advisor, Prime Minister's Office of Malaysia, have acted as peer reviewers of the preliminary draft assessment.

A draft of the final report was circulated to Kuwaiti stakeholders in June 2020, and the conclusions were presented in an online seminar hosted by KFAS and SCPD in July 2020.

The review was led by Alan Paic, Senior Policy Analyst (Directorate for Science, Technology and Innovation, OECD). The review report was drafted by Philippe Larrue, Alan Paic and Camille Viros (Directorate for Science, Technology and Innovation, OECD), with contributions from Erik Arnold (consultant to the OECD; Chairman of the Technopolis Group, Adjunct Professor at the Royal Institute of Technology in Stockholm) and Ravi Gupta (consultant to the OECD; CEO of Tambourine Ventures), and

valuable support from Panagiotis Barkas, Alpha Ouédraogo, and Blandine Serve (all from the Directorate for Science, Technology and Innovation, OECD).

We wish to acknowledge the financing provided by KFAS and the General Secretariat of the SCPD, as well as the support of the KFAS and SCPD teams, without whose valuable support this project would not have been possible. Our thanks to Adnan Shihab-Eldin, and his team, especially Abdullah Abu-Qumasha, Director of Strategy of KFAS, Bahareh Azizi, Consultant at KFAS, as well as Khaled Mahdi and his team at the SCPD.

The review draws on a Background report provided by KFAS, desk research of over 600 documents, and 4 in-country missions where 111 meetings were held with stakeholders from government, academia, businesses and civil society.

In addition, due to the lack of innovation and R&D statistics in Kuwait, the OECD team suggested the execution of a dedicated R&D and Innovation survey in Kuwait. This survey was executed during 2018 and 2019 by the Kuwait Central Statistical Bureau (KCSB) and KFAS with the support of GOPA consultants for the design and implementation of the survey.

The report has benefited in particular from comments provided by Director-General of KFAS, Adnan Shihab-Eldin, and the General Secretariat of the SCPD, Khaled Mahdi, as well as the members of the KFAS Board of Directors, who have been instrumental by providing their expertise and support. The report has also benefited from numerous Kuwaiti stakeholders, including the Kuwait Institute for Scientific Research, Kuwait University, the Central Bank of Kuwait, Kuwait Direct Investment Promotion Authority, private universities, Kuwait Investment Authority, Equate, Chamber of Commerce, and other private sector entities.

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Abbreviations and acronyms

A*STAR	Agency for Science, Technology and Research
ADIPEC	Abu Dhabi International Petroleum Exhibition & Conference
ATTRACT	Attracting Outstanding Young Researchers from Abroad (Luxembourg)
ACK	Australian College of Kuwait
AEI	Spanish Agency of Research
ANR	National Research Agency, France
AUM	American University of the Middle East
CAGR	Compound annual growth rate
CWTS	Centre for Science and Technology Studies
DDI	Dasman Diabetes Institute
D&I	Drilling and Intervention
FFG	Austrian industrial Research Promotion Agency
FISIM	Financial intermediation services indirectly measured
FTE	Full-time equivalent
FNR	Luxembourg National Research Fund
FRED	Federal Reserve Bank of St. Louis
GCC	Gulf Cooperation Council
GDP	Gross domestic product
GE	General Electric
GERD	Gross expenditure on R&D
GIC	Global Innovation Company for Software Development & Training
GSSCPD	General Secretariat of the Supreme Council for Planning and Development
HEIs	Higher education institutions
HHI	Herfindahl-Hirschmann Index
HIV	Human Immunodeficiency Virus
IAEA	International Atomic Energy Agency
IBK	Industrial Bank of Kuwait

IBS	Institute of Banking Studies
ICT	Information and communication technologies
IEA	International Association for the Evaluation of Educational Achievement
IED	Innovation and Enterprise Directorate
IFD	Innovation Fund Denmark
IMF	International Monetary Fund
IOCB	Institute for Organic Chemistry and Biochemistry
IP	Intellectual property
IP5	Five IP offices, including the European Patent Office, Japan Patent Office, Korean Intellectual Property office, the National Intellectual Property Administration of the People's Republic of China and the United States Patent and Trademark Office
JAC	Jaber Al Ahmed Centre for Molecular Imaging and Nuclear Medicine
JPO	Japan Patent Office
K-companies	Kuwait Petroleum Corporation, Kuwait Oil Company, Kuwait National Petroleum Company, Petrochemicals Industry Company and Kuwait Oil Tanker Company
KAPP	Kuwait Authority for Partnership Projects
KCSB	Kuwait Central Statistical Bureau
KDI	Korea Development Institute
KDIPA	Kuwait Development and Investment Promotion Agency
KFAS	Kuwait Foundation for the Advancement of Science
KIA	Kuwait Investment Authority
KIPRC	Kuwait International Petroleum Research Centre
KISR	Kuwait Institute for Scientific Research
KLSC	Kuwait Life Sciences Company
KNAW	Royal Netherlands Academy of Arts and Sciences
KNPC	Kuwait National Petroleum Company
KOC	Kuwait Oil Company
KOTC	Kuwait Oil Tanker Company
KPC	Kuwait Petroleum Corporation
KPI	Key Performance Indicators
KPPC	Kuwait Public Policy Centre
KRRP	Kuwait Research Review Panel
KSPDC	Kuwait Small Projects Development Company
KSTIC	Kuwait Science, Technology and Innovation Council
KU	Kuwait University
KWD	Kuwaiti Dinar

LSE	London School of Economics
MAS	Manufacturing Advisory Service
MENA	Middle East and North Africa
MIMOS Berhad	Malaysia's national Applied Research and Development Centre
MIT	Massachusetts Institute of Technology
MRDP	Medium-Range Development Plan
MSCI	Morgan Stanley Capital Incorporated
MSF	Multi-Stage Flash Distillation
MSMEs	Micro, Small & Medium Enterprises
MYR	Malaysian Ringgit
NASCO	National Advisory Services Company
NESTA	National Endowment for Science, Technology and the Arts, United Kingdom
NIH	National Institutes of Health
NPST	National Plan for Science, Technology, and Innovation (Saudi Arabia)
NSF	National Science Foundation
NTEC	National Technology Enterprises Company
OCR	Offices of contract research
OECD	Organisation for Economic Co-operation and Development
OPEC	Organization of the Petroleum Exporting Countries
PAAET	Public Authority for Applied Education and Training
PCT	WIPO Patent Cooperation Treaty
PDVSA	Petróleos de Venezuela Sociedad Anonima
PEARL	Attracting Leading Reasearchers from Abroad to Luxembourg
PET	Positron Emission Tomography
PIC	Petrochemicals Industry Company
PRIs	Public research institutes
PUC	Private Universities Council
Q1	First quartile (top 25%)
QMS	Quality Management System
RCA	Revealed comparative advantage
RD	Research Directorate
R&D	Research and Development
RO	Reverse Osmosis
R&T	Research and Technology
SAC	Sabah Al-Ahmed Centre for Giftedness and Creativity

SAR	Saudi Riyal
SBIR	Small Business Innovation Research
SCPD	Supreme Council for Planning and Development
SDGs	Sustainable Development Goals
SINTEF	Applied Research, Technology and Innovation, Norway
SITC	Standard International Trade Classification
SITRA	Finnish Innovation Fund
SMEs	Small and medium-sized enterprises
SOEs	State-owned enterprises
SPECT	Single Photon Emission Computed Tomography
SPI	Special Projects and Initiatives
SITRA	The Finnish Innovation Fund
STEM	Science, Technology, Engineering and Mathematics
ST	Strategic Thrust
STI	Science, technology and innovation
TES	Technology extension services
TFP	Total factor productivity
THE	Times Higher Education
TIMSS	Trends in International Mathematics and Science Study
TIP	OECD Working Party for Innovation and Technology policies
TRIPS	WTO Agreement on Trade-related Aspects of Intellectual Property Rights
TSCK	The Scientific Centre of Kuwait
TTOs	Technology transfer offices
UAE	United Arab Emirates
UKRI	UK Research and Innovation
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
USD	United States Dollar
USPTO	United States Patent and Trademark Office
VINNOVA	Sweden’s innovation agency
WCT	WIPO Copyright Treaty
WIPO	World Intellectual Property Organization
WITS	World Integrated Trade Solutions
WPPT	WIPO Performances and Phonograms Treaty

WRC	Water Research Centre
WTO	World Trade Organization
ZGI	Zain Great Ideas
ZIM	German Central Innovation Programme for SMEs

Executive summary

Oil has provided Kuwait with wealth and well-being for the past 80 years. Slowing demand for oil is threatening the sustainability of the current economic and social model, emphasising the need to transition towards a knowledge-based society – where value creation, the resolution of societal challenges and the well-being of society at large will be based on the production, diffusion and implementation of knowledge.

“New Kuwait”, an overarching national development plan, proposes a vision of transforming Kuwait into a trading and finance hub, and a transition toward a knowledge-based society (“Smart Kuwait”) by 2035.

The *OECD Review of Innovation Policy: Kuwait* offers an overview of the main characteristics of the country’s innovation system and policy, the challenges it faces, and the way forward towards a knowledge-based society.

It is based on extensive evidence, including a background report coordinated the Kuwait Foundation for the Advancement of Science (KFAS), desk research of over 600 documents, and 4 in-country missions where 111 meetings were held with stakeholders from government, academia, businesses and civil society. In addition, results of a dedicated innovation and R&D survey on 2 326 companies were used, providing initial insights on the innovation and R&D behaviour of Kuwaiti businesses.

Main characteristics of the Kuwaiti innovation system

The Kuwaiti fledgling innovation system includes a moderately developed research sector, concentrated around Kuwait University (KU) and the Kuwait Institute for Scientific Research (KISR), with additional contributions provided by the Ministry of Health, the Dasman Diabetes Institute and private universities.

There is some scale of research activity in the oil sector, as well as the chemicals and food industries. Healthcare is the leading sector in services, and a pocket of excellence exists in the medical technology sector.

Overall spending on R&D is estimated at 0.33-0.37% of gross domestic product, less than half of the level realised in neighbouring Saudi Arabia and the United Arab Emirates, and less than a fifth of the 2% target set in the Blue Ribbon report in 2007.

There is no governmental body – ministry or agency – with a mandate for policy making in science, technology and innovation (STI), and no national strategy pertaining to STI. The strategies and research agenda of the two main research institutions (KU and KISR) are developed mainly bottom-up and their research budgets are negotiated directly with the Ministry of Finance, while the KFAS finances individual projects. In particular, the link towards the “New Kuwait” Development Plan remains tenuous.

As a corollary of this set-up, there is also no governmental funding body for research, or for innovation, and little or no financial instruments to support STI activities. A USD 6.6 billion National Fund for SMEs supports entrepreneurship, but does not specifically support innovation, and some of its rules are discouraging in particular for technology start-ups, such as the rule about exclusive Kuwaiti ownership of equity, which precludes attracting foreign talent through equity.

At the centre of Kuwait's fledgling innovation system is KFAS, an institution that raises awareness, provides training grants for R&D projects in academia and business, and operates its own research centres.

The way forward towards "Smart Kuwait"

Going forward, Kuwait requires a clear strategy of promoting STI as a major enabler of the transition towards the knowledge society. Such a strategy should be articulated around the policy challenges and priority actions listed in Table 1.

Table 1. Main challenges and priority actions

Main policy challenges	Priority actions
Raise overall awareness and reduce barriers to innovation	• Promote science, innovation and entrepreneurship as national values. • Continue improving framework conditions for innovation • Unleash the innovative spirit of non-Kuwaitis by providing equal opportunity. • Further involve Kuwait in regional and international co-operation
Set up the appropriate governance and institutions for the science, technology and innovation (STI) system	• Develop an integrated national innovation strategy coherent with the vision for attaining "Smart Kuwait" in 2035. • Create a wide-scoping ministry with an overall mandate for STI policy • Create a fully professional and autonomous research and innovation agency. • Improve the production of STI-related statistics to enable the development of evidence-based policies.
Reinforce the scientific research base to ensure absorption and endogenous production of knowledge in selected niches of excellence	• Gradually increase funding for R&D in public and private institutions. • Introduce performance contracts for higher education and public research institutions. • Remove the disincentives to external funding in higher education institutions (HEIs) and research institutions. • Remove the bureaucratic barriers and streamline the basic processes involved in research activities in HEIs and research institutions. • Revise the teaching and research incentive systems implemented in HEIs to increase the engagement of faculty in research activities.
Develop support for business innovation	• Help businesses to engage in innovation and R&D through dedicated support schemes, including direct grants; consider the costs and benefits of a tax credit scheme. • Create a holistic support mechanism for start-up companies, including equity funding, incubation and acceleration schemes. • Use public procurement to encourage innovation. • Support the upgrade of innovation capabilities in state-owned enterprises.
Foster knowledge diffusion and co-creation between science and industry	• Initiate support for technology diffusion and absorption policies, such as technology extension services. • Develop a structured approach to creating links between business and academia • Provide incentives for individual researchers to unleash their creative potential. • Establish mechanisms for technology foresight and intelligence, in support of the proposed national innovation strategy.
Build up the human capital needed for the transition towards a knowledge-based economy and society	• Create a new public research university, focused on STEM disciplines. • Provide support for the establishment of strong doctoral schools involving world-class faculty. • Improve absorption capacity in SMEs by supporting upgrades in vocational education and training. • Provide for career mobility between science and industry. • Attract and support internationally recognised researchers. • Institutionalise nationwide forward planning of employment and skills.
Establish the role of STI in tackling societal challenges	• Articulate the national innovation strategy around key economic and societal priorities. • Launch a few large programmes to tackle societal challenges in line with national priorities.

1 Overall assessment and recommendations

This chapter presents an overall assessment of Kuwait's innovation system and policy, reflecting analytical findings of the review. It identifies the strengths and weaknesses of the national innovation system, and develops specific policy recommendations designed to facilitate Kuwait's transition towards "Smart Kuwait", a knowledge-driven society, which is the stated goal of the national development plan. Specific recommendations address the issues of governance of the overall innovation system, framework conditions for innovation, strengthening human resources, fostering critical mass and excellence in public research, intensifying diversification, fostering business innovation, and increasing and diversifying the sources of knowledge for enterprises.

1.1. Overview

1.1.1. The transition to a knowledge-based society has now become an imperative for Kuwait…

Originally a merchant economy at the tip of the Arabian Gulf, since 1938 and the discovery of oil, Kuwait has seen its economic and social development increasingly dependent on the extraction and exports of this commodity. Thanks to the oil rent, Kuwait has been able to ensure a high level of wealth and well-being for its population. This has also helped Kuwait recover relatively quickly from the Iraqi invasion in 1991 and continue its economic and demographic expansion.

However, while the oil rents are a source of wealth, they can also be a liability for Kuwait. The fall in oil prices in 2014-16 caused a fiscal deficit – the first one since the Iraqi invasion. This development has also lent credibility to a scenario of slowing global demand unravelling amid global concerns about carbon emissions coupled with the development of renewable energies and sustainable mobility, relying on alternative sources of energy. This is coupled with increased availability of oil, in particular driven by North American shale oil. These factors are likely to cause a stagnating, or even decreasing, demand for oil in the medium term. Such a development would transform the current paradigm of scarcity into one of an abundance of oil, transforming what has long been a seller's market into a buyer's one, with supply exceeding demand.

These prospects require Kuwait's leadership to accelerate the transition from a resource-based economy towards a knowledge-based society, where value creation, addressing societal challenges and the well-being of society at large will be based on the production, diffusion and implementation of knowledge.

It is worthwhile noting that while Kuwait's fiscal sustainability will be challenged in the medium to long term, Kuwait enjoys a strong position when compared to its GCC neighbours. A recent IMF study shows that Kuwait still has a positive fiscal balance, and even though this is bound to worsen, there is significant accumulated wealth and no external government debt (IMF, 2020). Therefore there is still time to organise and finance this transition.

1.1.2. …and in spite of historic foundations favourable to science and innovation…

Historically, Kuwait presents a unique example of a bottom-up drive for education and knowledge. In 1936, before the discovery of oil, representatives of Kuwait's merchant class requested the Amir to develop a formal education system and volunteered to finance it from a new tax. In 1976, representatives of the private sector asked the Amir to develop scientific research, financed by a 5% tax on the profits of Kuwaiti-owned firms, giving rise to the Kuwait Foundation for the Advancement of Sciences (KFAS).

Kuwait's present-day Constitution of 1962 (reinstated in 1992) explicitly refers to scientific research in two of its articles:

- Article 14: The state shall supervise education, literature and the arts, and shall encourage scientific research.
- Article 36: Freedom of opinion and scientific research is guaranteed. Subject to the conditions and stipulations specified by law, every person shall have the right to express his opinion by speaking or writing or otherwise.

1.1.3. …the transition is yet to commence

Diversification of the economy has long been on the political agenda of the government and "New Kuwait", an ambitious 25-year national development plan, has been launched, with the goal of transforming Kuwait into a finance and trading hub, transitioning towards a knowledge-based economy[1] by 2035.

Nevertheless, little has been achieved towards the objective of reducing dependence on oil and UNCTAD data show that Kuwait's exports are as concentrated today as they were in 1995, contrary to its Gulf Cooperation Council (GCC) neighbours, who have significantly decreased their export concentration over the previous decades. Kuwait therefore appears today as the single most resource-dependent economy in the region.

The only diversification that has been initiated concerns chemicals, rubber and plastic products, which now represent 1.6% of gross domestic product (GDP) and 4.5% of exports in 2018. The sector has been the fastest-growing sector, with an annual compound growth of more than 15%, which increased nearly threefold between 2010 and 2017. However, the sector unfortunately has followed the same cycle as oil, as was experienced during the 2014-15 bust when it also suffered from the oil price decrease.

More notably, the high value-added sectors of trade and finance, which are the priority sectors specified by the "New Kuwait" vision, grew at an annual compound growth rate of 0.3% and 0.5% respectively between 2010 and 2017, much more slowly than either the oil (2.2%) or non-oil[2] (2.8%) sectors. Another large and fast-growing sector is public administration and defence, which grew at an annual compound rate of 5.9% between 2010 and 2017 and represented 10.6% of GDP in 2017.

Innovation performance has been below potential as suggested at the macro level by the falling trend in total factor productivity growth over the past 40 years. Publication statistics, as well as the number of patent applications and the share of high and medium-high R&D-intensive products in total Kuwaiti exports, also reveal poor innovation performance (see Box 1.1 for more details).

Box 1.1. Kuwait's science, technology and innovation performance in figures

Innovation inputs

Based on a consolidation of data provided by Kuwaiti research actors, as well as an estimate of the dedicated innovation and R&D survey,[1] one could infer an overall figure for R&D expenditures in Kuwait of between KWD 120 million and KWD 135 million (0.33-0.37% of GDP,[2] see Table 2.3 in Chapter 2). This estimate should be taken with caution, as it depends on hypotheses (notably on universities' faculty engagement in research activities) and on the results of a first ever R&D survey in Kuwait. Providing a robust measure of gross domestic expenditure on R&D (GERD) would necessitate a stronger endeavour to collect, process and publish data according to recognised international standards with regards to statistics on research and experimental development (R&D) (OECD, 2015a) and innovation (OECD/Eurostat, 2019).

Government spending on education is relatively high, at around KWD 2.4 billion, equal to around 5.5% of Kuwait's GDP. However, Kuwait's performance in terms of education outputs has room for improvement, in particular in mathematics and sciences, enrolment in higher education (54.4% in 2018) as well as the performance of Kuwait's universities in international rankings.[3]

The labour force involved in research activities has grown strongly in Kuwait over the past 10-15 years. According to UNESCO data, there are about 3 000 full-time equivalent (FTE) R&D workers in Kuwait, but this number does not include R&D workers from private non-profit and business enterprise sectors. According to the KCSB survey, there are at least 1 100 FTE R&D workers reported by the companies surveyed. This is to be added to the UNESCO figure and is only the lower bound of the total R&D personnel in businesses, as the KCSB survey does not include all Kuwaiti businesses and in particular does not include large companies such as the Kuwait Petroleum Corporation. This R&D personnel figure is comparable to other Gulf Cooperation Council (GCC) countries, but well below most other resource-rich countries.

Research and innovation outputs

The quantity of publications published by Kuwaiti universities and research institutes has been low in international comparison, at around 0.05% of world publications. While the percentage of Kuwaiti publications among the 10% most cited – an indicator of publication quality and research excellence – is higher than in most Latin American countries, Bahrain and Oman, at around 6% in 2018, it is much lower than for Qatar, Saudi Arabia, the United Arab Emirates and most OECD countries.

Kuwait also fares poorly in terms of international collaboration on scientific research, with only 58% of documents published being affiliated with more than one country address in 2018 – lower than for all other GCC countries.

Kuwait has filed more patent applications per million inhabitants to the US Patent and Trademark Office than Saudi Arabia and the United Arab Emirates, with 19.2 applications per million inhabitants on average in 2012-16. However, Kuwait's number of applications to the European Patent Office and the number of patents filed to at least two patent offices worldwide (IP5 families) are much lower, with 1.5 and 1.1 applications per million inhabitants respectively on average in 2012-16.

Kuwait's performance has room for improvement in terms of R&D-intensive exports compared with other resource-rich countries, with high and medium-high R&D-intensive products accounting for only 6.6% of its total exports. The average share of high and medium-high R&D-intensive products in total exports of Bahrain, Oman, Qatar and Saudi Arabia was more than twice that in Kuwait (13.7% in 2018).

1. Conducted by the Kuwait Central Statistical Bureau (KCSB), with support from the Kuwait Foundation for the Advancement of Sciences and the Supreme Council for Planning and Development.
2. Official statistics for R&D expenditure do not exist. Preliminary figure obtained by consolidation of data from Kuwaiti sources. Includes a very preliminary figure from the Kuwait National Petroleum Company, which is awaiting confirmation/revision.
3. For a benchmark of Kuwait's performance in university rankings, please refer to the section on higher education and research below.

1.2. The 2007 Blue Ribbon report, more than a decade later

Strategic reflection about the Kuwaiti innovation system was initiated by the report of the Kuwait Research Panel, also known as the Blue Ribbon report, in 2007 (Mahdy Al-Jazzaf, 2007). The report made clear recommendations as to how the national wealth could be used as a resource to spur knowledge creation and support productivity growth in order to bring well-being to society. The report provides a useful framework and baseline to assess progress accomplished since 2007.

1.2.1. Implementation of the recommendations of the Blue Ribbon report are below expectations

The report, co-authored by Nobel laureate Ahmed Zewail, recommended raising R&D expenditure to 2% of GDP, as well as the establishment of a high-level governing body – the Kuwait Science, Technology and Innovation Council (KSTIC) – which was to co-ordinate the report's other recommendations, such as the restructuring of the Kuwait Institute of Scientific Research (KISR) and the creation of Kuwait centres of excellence in petroleum and petrochemicals, water, and renewable energy. The same report recommended repositioning KFAS into roles similar to those of the National Science Foundation (NSF) and the National Institutes of Health (NIH) in the United States, integrating public and private sector activities, supporting research faculty, funding research programmes, supporting technology commercialisation as well as pre-university education in science and mathematics.

Unfortunately, few of the recommendations have been implemented. In particular, the overall governance of the science, technology and innovation (STI) system has not been established. Not only has the KSTIC or an equivalent not yet been established, but there is also no governmental body (ministry or agency) with a mandate to support scientific research or innovation in the business sector. There is also no strategic document that states priorities for scientific research or for innovation in the business sector. Support for science, technology and innovation is thus mainly focused on supporting applied research at KISR, and, to a lesser degree, basic research at Kuwait University (KU). A complement is brought by privately funded knowledge institutions (KFAS centres, private universities), which have growing but still rather limited research activities. Funding for KISR and KU is negotiated directly with the Ministry of Finance and approved by parliament, without a formal scientific research strategy and vision, and the links to the "New Kuwait" development strategy are tenuous at best.

The KSTIC is still under discussion, presently downgraded to the status of a committee rather than a council. At the same time, no other governmental body has a clear mandate for STI (neither the Ministry of Higher Education nor the Ministry of Commerce and Industry have a specific mandate for STI). Therefore, such a committee would have to promote actively the national agenda for scientific research and business innovation, rather than just play a policy co-ordination and arbitrage role between ministries, as is the case in innovation advisory councils in most OECD countries.

KISR itself has been restructured and specific centres have been established for petroleum, water and renewable energy. Bureaucracy has been reduced somewhat. However, rules and regulations do not allow flexible response to market needs and commercialisation aspects and internationalisation are still weak. Strong barriers exist for sharing information across the organisation and with other institutions.

KFAS has also engaged in significant restructuring and streamlining of both its internal activities and those of its six centres in order to better fulfil its wide missions. Its centres still, however, draw significantly on its increasingly stretched resources – despite some progress in handing over some non-research related costs to public authorities – and KFAS remains far from having the resources and status to serve the functions of a full-fledged research and innovation agency or foundation.

As for the business sector, entrepreneurship support is offered through the National Fund for SMEs, which has been established with an endowment of KWD 2 billion (USD 6.5 billion). However, its focus is primarily on entrepreneurship, and somewhat on established SMEs, while large enterprises lack support for the diffusion of knowledge and the creation of value added in the economy.

1.3. The role of science, technology and innovation in the Kuwaiti society

1.3.1. Science, technology and innovation have yet to become major enablers of "New Kuwait"

The Kuwaiti government launched a 25-year development plan in 2010, which states the government's vision: "*[To] transform Kuwait into a financial and trade centre, attractive to investors, where the private sector leads the economy, creating competition and promoting production efficiency, under the umbrella of enabling government institutions, which accentuates values, safeguards social identity, and achieves human resource development as well as balanced development, providing adequate infrastructure, advanced legislation and inspiring business environment.*"

Rebranded as "New Kuwait" in 2014, the plan is further divided into five themes and seven pillars: 1) a reform of the administration in order to make it more transparent, effective and accountable; 2) stimulating competition and innovation in the private sector; 3) modernising infrastructure including ICT, transportation and electricity; 4) sustainable environmental policies; 5) development of the healthcare system; 6) education and human capital development; and 7) international positioning.

"New Kuwait" foresees privatisations of state-owned enterprises, making large infrastructure investments and the development of the private sector, notably through a USD 6.5 billion National Fund for SMEs. It is implemented through five-year mid-range development plans (MRDPs).

"New Kuwait" proceeds in phases and each five-year phase, corresponding to an MRDP, has a specific focus. While the focus of the previous MRDP (2015-19) was on legislative activities and infrastructure projects, the focus in 2020-25 is on private sector engagement and initiatives, while the development of a knowledge-based economy is pushed back to 2025-30 (Mahdi, n.d.). Given the long lead times in building up the appropriate systems and human capital for this transition, this timeline introduces the concept of a knowledge economy too late to achieve the objective of "Smart Kuwait" by 2035. The ongoing New Kuwait programme does contain a thematic area on the knowledge economy, which groups together a number of projects linked mostly to KISR's activities. However, the link with an overall vision of the knowledge economy and society seems to be missing.

At this point it is important to note the two interlinked, but distinct, concepts of knowledge-based economy and knowledge based society:

- Powell and Snellman (2004) define a knowledge-based economy as "production and services based on knowledge-intensive activities that contribute to an accelerated pace of technical and scientific advance, as well as rapid obsolescence. The key component of a knowledge economy is a greater reliance on intellectual capabilities than on physical inputs or natural resources".
- A knowledge-based society is one where value creation, the resolution of societal challenges and the well-being of society at large will be based on the production, diffusion and implementation of knowledge. It therefore has implications for society beyond solely economic aspects.

It is therefore essential to create an approach towards a knowledge-based economy and society, in order to warrant inclusiveness and well-being for all citizens and residents.

1.3.2. The current social contract does not provide sufficient incentives for innovation

The prevailing social contract in Kuwait is that of a very generous welfare state, which not only provides security, infrastructure, education and healthcare, but also subsidised energy, staples and well-paid government jobs to its citizens. There are therefore limited incentives for Kuwaitis to engage in risky activities such as innovation and entrepreneurship. It also discourages nationals to work in the private sector, including positions in large corporations, which would be seen as very attractive in most OECD countries.

The "New Kuwait" Development Plan foresees a significant shift towards the private sector, mainly because the rising public wage bill is not sustainable in the long term. However, as long as the oil rent continues flowing, it will be difficult to cut back on what Kuwaitis see as their acquired rights. In particular, a government job is seen as a way to deliver the right of Kuwaiti citizens to their share of the oil rent.

One way out of this bind would be the separation of the "entitlement to the rent" from employment in a government entity (public administration or state-owned enterprise). To some extent, this is already in place with the "workforce support" supplement to Kuwaitis working in the private sector, but such support seems to be insufficient to incentivise widespread applications to private sector jobs. For entrepreneurs, the situation is even less favourable, and there is little incentive to forego risk-free employment in the government sector in order to start a business.

In parallel, a strong signal is needed from Kuwaiti leadership that could be interpreted as a moral encouragement in favour of entrepreneurship. The recent initiative of the Amiri Diwan[3] to establish a national innovation centre could play a decisive role in this sense, since it may be an indication to the population that innovation is a priority, and will be valued by the supreme leadership of the country.

Such a symbolic signal can appeal to the higher needs of the population, such as social esteem and self-actualisation. Kuwaitis do not need entrepreneurship to satisfy their basic livelihood needs such as physiological and safety needs – those are more than adequately filled by comfortable government jobs they can easily access (for the time being). A strong signal from leadership can create the perception that engagement in such activities will indeed increase their social status and self-actualisation goals.

1.4. Governance of the science, technology and innovation system

Governance is key to the way all organisations work, whether they be ministries, schools, companies or universities. There is no one best way to govern STI, since it is deeply embedded in each country's overall political system and heavily depends on its economic and social values; good practices in OECD countries cannot all be directly adapted to Gulf countries. However, some general principles that leave a great deal of freedom in their application can be used as a reference framework.

Strategic orientation and co-ordination: Originating from the highest level of the governance structure, but building on dialogue and consultation with a wide array of stakeholders, a clear mid- to long-term vision should inspire and guide higher education, research and innovation activities so that they contribute effectively to the type of economic and social development the country seeks. In turn, these broad strategic orientations should be embodied in strategic action plans, with an account of the measures and financial resources used to reach the strategic objectives with a defined timeframe and with ambitious – yet realistic – objectives. Since STI activities cut across many sectors and policy areas, the strategic framework should cover the policy objectives and interventions of various ministries and agencies in order to ensure their overall consistency towards common broad objectives. Specific institutions, such as high-level research and innovation councils, committees, interdepartmental platforms, and other formal or informal means of decision making and dialogue, are frequently used in countries to allow co-ordination within and across disciplinary, sectoral and policy silos.

Strategic policy intelligence: Governance is not a simple matter of top-down "steering" in which an all-knowing principal sets agents to work to achieve centrally generated goals. It involves competition, consensus-building, networking and negotiating decisions in arenas in which multiple actors are involved, based on clear and reliable data and evidence about what has worked or not in the past, current trends and what information supports the different socially desirable goals for the future. Strategies should therefore rely on strategic policy intelligence, i.e. the capacity to collectively produce, analyse and negotiate the information government needs to take "good" policy decisions. It entails statistical data, studies, and the results of policy monitoring and evaluation so that strategies and priority-setting initiatives, but also policy formulation and implementation, build on evidence and broad buy-in from stakeholders.

Funding: Sufficient and predictable financial resources and appropriate incentives for good performance and accountability are necessary to support the achievement of overall goals and priorities. Mid-term predictability of resource levels is a key precondition for those planning research and innovation activities. This is especially true for research activities where long time horizons and the accumulation of knowledge often make sustained investment key to achieve real progress. International experience shows that strategies without resources commensurate with their ambitions have only a limited influence. However, the different funding streams are not only a matter of providing sufficient resources for research and innovation activities, they are also steering mechanisms. They provide incentives to undertake these activities and make complementary investments in certain priority areas.

1.4.1. The Kuwaiti science, technology and innovation policy systems

The Kuwaiti innovation system has not yet established some of the key dedicated institutions that will help govern the transformation of the economy.

An “interactive chain” of interrelated institutions dedicated to STI activities at the different levels of the system – from strategic orientation and policy formulation to policy implementation – is missing. These institutions perform complementary functions considered essential in the research and innovation systems of various countries at different stages of development:

- A mechanism for high-level strategic advice and co-ordination, in which the research and innovation interventions of key ministries (notably their development projects as well as relevant procurements and regulations) should be embedded. Beside representatives of higher education and research institutions and civil society, the Ministry of Health, the Ministry of Oil, and the Ministry of Electricity and Water could be involved in this “strategy and co-ordination device”. In many countries, this takes the form of a specific high-level STI strategic council. As previously mentioned, this option has been proposed and defended in Kuwait at different moments in the past, but finally recently rejected for financial reasons.
- Ministries responsible for research and/or innovation policy making and co-ordination (whether inside or separate from the authorities in charge of higher education, and with a different scope) provide strategic guidance in co-operation with other parts of the system in many OECD countries. They are also often in charge of the negotiation and overall allocation of a distinct research and research-based innovation budget, allocated to agencies and directly to relevant institutions via institutional funding. In Kuwait, there is no dedicated ministry in charge of research and/or innovation.
- Agencies for higher education, research and/or innovation. Agencies come with very different scopes and types of autonomy and it is clear that the “western model” of agencies cannot be simply adopted in Kuwait without ensuring that their design is consistent with the characteristics of the national innovation system. However, some ministries in other policy fields in Kuwait have a dedicated agency (or an “authority”) implementing their policy and reporting to them. However, there is neither a research nor an innovation agency that funds and promotes basic and applied research and links it to innovation in industry, government and other parts of society. Elements of these functions already exist, but only in a fragmented manner in Kuwait (notably through KFAS and more recently through the National Fund). Interestingly, some countries have opted for an integrated research and innovation agency (e.g. UKRI in the United Kingdom) or at least a research agency with a wide scope from research to research-based innovation (e.g. the Research Council of Norway).

1.4.2. Strategic orientation and co-ordination

The provision of strategic plans has been instrumental in the economic development and catch-up of many countries in Asia, Latin America and Europe (e.g. the planning process in France, the prominent role of the Ministry of Economy, Trade and Industry in Japan and the Economic Planning Unit in Malaysia). However, to be useful guides for a wide range of actors on which the successful implementation of the plans depends, some key conditions should be met. Several of these conditions are missing in Kuwait.

The strategic planning capacity at the General Secretariat of the Supreme Council for Planning and Development has improved and efforts to ensure the sustainability of this strengthened capacity are ongoing.

The formal content of the Kuwait MRDP 2015-2020 marks an improvement compared with its predecessor – which had been criticised for the lack of clarity of its links between objectives and policies, its vaguely defined policies, missing key performance indicators (KPIs) and the low relevance of some projects. At least part of this improvement is due to co-operation with the United Nations Development Programme (UNDP) in several projects since 2011. The Kuwait Public Policy Centre (KPPC), established under one of these projects, is an important element of this strengthened capacity. However, the UNDP’s evaluation

for the establishment of the KPPC rated its sustainability as "moderately likely" and noted that many activities were unlikely to continue or may lose momentum after project completion (UNDP, 2018). This was considered particularly the case for evidence-based research, planning and monitoring, which lie at the core of the strategic planning process.[4] In response to these concerns, dedicated efforts to build the endogenous capacity by transferring knowledge and skills to the national staff are ongoing.

The effects of national development plans on the extent and directions of STI activities of the different government bodies are unclear

While it is always a difficult task to assess the influence of a strategic plan on concrete activities, investigations suggest that it is limited in the case of the MRDP. This is due notably to the mainly bottom-up process according to which projects are generated by ministries, the indirect link to potential additional resources and the lack of visibility of the plan.

First, the MRDPs provide only indirect incentives for the different government bodies to propose projects and initiatives that contribute to their achievement. Although the OECD Review team received different, and sometimes contradictory, information on this matter, it seems that there is no central budget for funding the plan's projects, despite announcements of a total budget at the beginning of the period (KWD 34.15 billion, or over USD 112 billion). Projects are initiated by individual ministries based on broad strategic orientations and submitted to the Supreme Council for Planning and Development (SCPD) for inclusion under the plan, following a multi-step project approval process. The financial resources for funding the projects originate from the ministries' budgets (and other project partners, if any), as negotiated with the Ministry of Finance, which reviews ministries' budgetary requests, item by item. The incentive effect therefore mainly relies on the premise that the national priority "label" of these projects can be leveraged in the context of these negotiations with the Ministry of Finance.

Beside the provision of additional funding, a necessary condition for strategic plans to be impactful is that they have a high level of visibility and are clearly understandable by stakeholders. In Kuwait, the MRDPs and New Kuwait Development Plan were rarely referred to as important in the decisions taken by the numerous policy makers, heads of institutions and programme directors met by the Review team. Even more, these actors often seem to have little concrete knowledge of the content and process of the plans or, for instance, of the difference between the Kuwait MRDP and the New Kuwait Development Plan. This situation clearly contrasts with countries such as Kazakhstan or Malaysia, where national strategic plans appear as the strategic frameworks of reference for many public and private actors.

Finally, although the implementation of the plan has improved relative to its predecessor – as regards its execution rate at the minimum – there are some remaining weaknesses, as claimed in interviews and noted in the context of the evaluation of projects conducted with the UNDP.

The concrete status and content of some of the projects falling under New Kuwait and mid-range strategic plans' projects are unclear

The Kuwait strategic framework is composed of the New Kuwait Development Plan to achieve the Vision 2035, implemented through the five-year MRDPs. New MRDP projects are selected and financed each year as part of the annual budgetary cycle, and monitored on the New Kuwait platform. Apart from the large infrastructure projects, it has proven difficult to trace back some of the projects listed in the strategic plans to concrete activities on the ground. There seems to be little knowledge of several of these projects among key STI actors, even at the highest level, and confusion as to what these projects entail and how they fit into the strategic agendas of organisations such as KU and KISR – the two *de facto* main implementation bodies for STI policy.

The overlap of two sets of projects – the one planned as part of the MRDP and those presented on the New Kuwait site – also creates some confusion. The overall logic of the linkages between the MRDP and

the New Kuwait Development Plan is clearly set out by the General Secretariat of the Supreme Council for Planning and Development (GSSCPD), but the connections between the projects falling under these respective plans remain difficult to understand – for the OECD Review team as well as for many of the stakeholders it met. A set of projects is announced at the launch of a new MRDP, which only partially corresponds to the projects on the ground (some of them not implemented but apparently presented in the MRDP as potential "examples of projects" during discussions) which, as explained above, are decided annually as part of the SCPD selection process, followed by budgetary approval from the Ministry of Finance.

The STI investment and reform initiatives in the New Kuwait Development Plan are too little and planned too late to achieve Kuwait's goal of becoming a knowledge economy by 2035

As previously mentioned, the New Kuwait Development Plan relies on an incremental approach to achieve its Vision 2035. The priority during the current planning period 2015-20 is on infrastructure through several mega-projects and the next period will emphasise the privatisation of the economy. The knowledge economy will feature prominently in the strategic plan only from the period 2025-30 onward. Setting a strategic framework with two "nested" time horizons – mid-term five-year plans contributing to a long-term plan and vision up to 2035 – is a good practice, as it allows long-term strategic consistency, regular adjustments and a gradual approach. However, the priority on the knowledge-based development projects starting only in 2025 appears to come about very late (not least when compared to regional neighbours such as Saudi Arabia and the United Arab Emirates) and fails to take account of the long lead times required to build human capital. Building a competitive research and innovation capacity is an incremental and long-term process, subject to increasing returns (due, for instance, to critical mass effects and network externalities). Kuwait is already lagging a long way behind in the international research and innovation community. Waiting any longer would make it even more difficult for the country to find its position in this already crowded landscape.

STI-related projects are relatively marginal in recent and current strategic plans, in both number and budget

None of the MRDPs include research and/or innovation as one of their pillars or main objectives. The latest MRDP 2020-25 gathers most of the relevant objectives under the second theme "Foster a dynamic private sector", which encompasses the objectives "Create an integrated ecosystem for technology, innovation, and knowledge", "Expand the private sector's role in SME incubation, funding and upscaling", and "Develop new priority sectors for the economy". It is too early to analyse the projects that will be initiated under this plan, but a review of the two last MRDPs (2010/11-2014/15 and 2015/16-2019/20) on the basis of available information shows that projects addressing STI-related issues remain relatively marginal and focused on research, following a rather linear view of the innovation process, based on the idea that innovation mainly proceeds from basic science, applied research and technology transfer.

This traditional approach justifies investments in projects that aim mainly to strengthen the research capacity and research support activities (in the KSIR, KU, Kuwait Petroleum Corporation [KPC], private universities, etc.), while innovation and the development of technological capabilities in companies do not feature prominently in any of these plans as a tool to promote the diversification of the economy beyond oil. While these projects are laudable, and while KISR has expertise that will be instrumental in supporting private sector innovation capacity, it is not clear that such projects mark a clear change to the traditional science-push approach that still dominates in the Kuwait innovation system and has resulted in limited intellectual property and commercial innovation so far. A shift toward co-creation practices, where different innovation actors gather under a joint project to achieve a mutually beneficial outcome, would be beneficial to these large strategic projects.

This approach contrasts, for instance, with national strategic plans in Saudi Arabia, where many activities relate directly to strengthening manufacturing capacity and upgrading the innovation capabilities of firms, which often – as would be expected in Kuwait – do not draw on inputs from science, but from other firms' and experts' capabilities.

The plans make also little use of the procurement capacity of state-owned companies to support innovation, while it could represent an essential resource, in particular in this period where the private sector is still underdeveloped.

There is no dedicated STI strategy to guide investments and activities of Kuwaiti research and innovation actors

National development plans should feed into cascading strategies and action plans, from those covering the national STI system to those of specific institutions and operating units within them. In Kuwait, there is no dedicated strategic framework that would provide direction and guidance to the STI community. There is therefore a gap between the national development plans and those of specific institutions such as KISR and KU. Given the importance of KISR, it could be argued that its strategy (currently the 8th KISR Strategic Plan) spans the entire system. This argument is only partially valid, since KISR's strategy covers neither basic research nor higher education activities carried out by other institutions. More importantly, this strategy does not engage the different ministries and authorities whose funding, projects and procurement should form the backbone of such a national STI strategy. Finally, these strategies also have a less tangible role, but not less important, for "inspiring" actors of the system and creating a sense of a community acting towards common objectives. This is particularly the case of those strategies oriented towards clearly defined "missions" or "challenges" to be realised in a given timeframe, such as the new High-Tech Strategy in Germany, the Dutch mission-driven Top Sector policy or the United Kingdom's Industrial Strategy based on grand challenge missions.

Originating from the highest level of governance and developed in consultation with stakeholders, most OECD countries have a clear mid- to long-term strategy (or a combination of both: for example, a ten-year strategy revised every four years as in Norway or Spain). Thirty-three of 35 OECD countries recently surveyed were found to have national STI strategies or plans beyond specific research and/or industrial strategies (Borowiecki and Paunov, 2018).

The monitoring of the strategic plans focuses on the execution of projects and relies on unclear key indicators

The General Secretariat of the SCPD is legally required to make quarterly interim reports to the SCPD and to the Cabinet, as well as biannual comprehensive reports to the National Assembly regarding the performance of development projects and the current status of development plans.

Against this backdrop, the New Kuwait platform provides monitoring data for the general public, as well as more comprehensive information with restricted access. However, the data made available relate only to the operational execution of projects (financial disbursement and production of deliverables), without further information on what has been achieved. While it is understandable that the execution of projects is key, notably following the poor execution rate of the previous plan,[5] it is important to consider indicators related to results and impacts as well. Some key indicators are specified at the project level to monitor impact, but these remain vague and broad. This weakness had already been identified in the previous MRDP (Al-Mahmood, 2017). For instance, the three key indicators of the aforementioned project undertaken by KISR are: 1) extent of the value chain; 2) development of the production process; and 3) nature of the competitive advantage.[6] They hardly comply with the classic features expected from "SMART" KPIs, i.e. Specific, Measurable, Attainable, Relevant and Time-bound.

1.4.3. Science, technology and innovation policy formulation and funding

In the absence of dedicated STI public authorities, government support to STI activities is bottom-up and led by the research supply side

As described at the beginning of this chapter, there is no dedicated ministry in charge of research and/or innovation, nor research and/or innovation agencies. In other countries, these institutions not only develop and implement the relevant research and innovation policies; they also ensure the legitimacy of these policy fields and negotiate with central actors and the Ministry of Finance.

The absence of funding institutions in Kuwait that would lead research and innovation actors to contribute to socially desirable goals is compounded by limited absorptive capacity in business and government to "pull" research into areas of economic and social need. Hence, policy is *de facto* dominated by the supply side – in the first instance KISR. Despite efforts of the latter to integrate its clients and stakeholders in its strategic planning process, the overall approach at national level remains linear. This linear approach began to be abandoned 50 years ago among wealthy nations as the OECD developed the idea of science policy as a way to connect science to societal needs. In Kuwait today, there is little systemic thinking about the STI policy mix needed to encourage development across the whole system that takes proper account of present and future needs. There is an urgent need for an "arena" or "meeting place" to develop STI policy that involves a wide range of relevant stakeholders and is equipped with the data and strategic intelligence needed to reach decisions of national interest that are informed by evidence rather than the need to satisfy special interests, notably those of the research capacity already in place.

Given the importance of the public sector and the very low current innovation capabilities of the private sector, line ministries should spearhead the initiatives aiming to stimulate research and innovation via their procurement power. Despite the current budget restrictions, the amount of public procurement remains considerable. In addition to more funding, a reform of the procurement rules and a reorientation of the goods and services procured by the government would be an important step forward. Significant experience has been gathered in many countries on the strategic use of public procurement to boost innovation. This involves, for instance, setting regulations and supporting standards that require some firms to adapt their products, or in placing orders for the fulfilment of certain functions or needs above the current state of the art, which could be met within a reasonable period of time through a new or improved product. The latter proceeds, for instance, via the design of "functional" terms of reference that refer to a certain level of performance to be achieved by the purchased goods and services, rather than providing detailed specifications of these goods and services and prioritising price competition between bidders (Edquist et al., 2015). In Kuwait, as it has been instrumental in Malaysia (OECD, 2016), innovative procurements could include specific provisions to ensure that Kuwaiti companies also benefit and learn from these large and challenging projects (for instance using partnerships with foreign companies, local content requirement measures, knowledge/technology transfer arrangements, etc.).

Despite repeated calls in previous reports and evaluations, there is still no STI policy nor high-level STI body to drive research and innovation policy in Kuwait

Without high-level policy actors who have the needed awareness, expertise and/or mandate to support and endorse any significant proposals, past and current attempts from the KRRP, KISR or KFAS to develop a proper STI policy, with the relevant budget and dedicated institutions, have had only limited results when confronted with the budgetary priorities of the powerful Ministry of Finance.

The Blue Ribbon report's proposal for the creation of a high-level STI body (the KSTIC) in charge of developing a proper STI policy was broadly in line with international experiences which suggest that effective councils – such as the Finnish one – involve the strongest government ministers, notably the Prime Minister, as members and need an effective secretariat and dedicated resources. The KSTIC was to be made up of key ministers and senior representatives of the research and business communities. Its

mandate was clearly to be an advisory council, without a policy implementation role. The KSTIC was never created, and it is questionable that a concept adapted to Finland would have worked in Kuwait. Indeed, the role of the Finnish Council is mainly to co-ordinate and arbitrate between the different ministries' strategies, policies and instruments, but those building blocks are lacking in Kuwait, so the need is to create policy making before it can be subject to co-ordination. Moreover, although advisory and strategic councils are common across the OECD (in place in 31 of 35 OECD countries surveyed at the time), some countries like Norway have found other ways to ensure STI interministerial co-ordination (OECD, 2017).

KISR has proposed to act as the leader of the proposed policy framework, as planned at the creation of the institute at the end of the 1960s. However, these efforts have faced strong resistance, since this role would conflict with its primary mission that involves being one of the main beneficiaries of the funds allocated. As a research institute, it is also regarded by some as lacking the high-level authority needed to have significant influence over the STI policy of various ministries.

In 2019, KFAS proposed the establishment of a "Higher National Research Committee". However, its proposed mandate mixes the functions of policy formulation and that of an agency (also named "funding council", hence the confusion in some instances). These functions involve very different tasks and therefore capabilities and level of legitimacy. Agencies are process-oriented and autonomous administrations whose main role is to allocate funds in a transparent and efficient way. In sharp contrast with these operational tasks, advisory councils/committees strive to exert their co-ordination authority over the responsibilities of specific ministries. A dual mandate involves conflicts of interest, as the advisory component might be tempted to provide the government with recommendations that best serve its plan, which most often involves, in the case of an autonomous organisation, its expansion in size and mandate.

Following long negotiations, leading to legal proposals, the different proposals were finally downgraded then discarded for budgetary reasons by the Ministry of Finance.

The government's investment in STI activities is not consistent with its ambition to develop a diversified knowledge-based economy by 2035

Overall spending on R&D is estimated at 0.33-0.37%[7] of GDP, a fifth of the 2% target set in the Blue Ribbon report in 2007, and only half of the spending realised in neighbouring Saudi Arabia and the United Arab Emirates.

Given the lack of public bodies dedicated specifically to supporting research and/or innovation activities, it is hardly surprising that the proportion of GDP that is dedicated to research and innovation activities is low by international standards. The two issues are of course tightly interlinked: without significant budgets for research and innovation, there is limited need for distinct ministerial authorities to steer and administer these limited resources or for a dedicated agency to allocate these funds; and without distinct STI institutions, the system lacks high-level promoters of research and innovation who can negotiate with central authorities and the Ministry of Finance and make the case for substantial STI budgets. The National Fund for SMEs has resources, which are an order of magnitude larger than those dedicated to STI, with a mission to stimulate entrepreneurship. However, successful entrepreneurship usually critically depends on innovation. Kuwait could therefore consider integrating those two policy areas to create larger impact on employment and the advancement of society in general. In order to support entrepreneurship and innovation in SMEs successfully, it is of paramount importance to strengthen their absorptive capacity, i.e. their ability to identify, assimilate, transform and use external knowledge on innovation practices. The Public Authority for Applied Education and Training (PAAET), the main provider of vocational education in its dedicated training institutes (in energy, telecommunications, etc.), could be very instrumental in providing such services.

There is no direct mechanism for mobilising some of the financial surplus generated from oil extraction towards fostering the knowledge economy

Some other resource-rich countries have established sectoral R&D obligations, under the classic rationale of underinvestment in research, reinforced by the fact that oil and gas resources are non-renewable. These countries save some of the proceeds of the exploitation of these resources and invest them in research in order to expand the range of future clean energy options. This can be done through specific regulations obliging firms to invest in R&D themselves or, failing that, to contribute to a common fund whose proceeds are then invested in research (the creation of KISR was the result of such "offset" from a Japanese company). Kazakhstan and Norway offer examples of this approach, using very different models from which Kuwait could draw lessons to find its own approach. Saudi Arabia also increasingly uses its sovereign wealth fund, the Public Investment Fund, to invest in innovation projects (electric vehicles, solar panels, autonomous vehicles, etc.).

In Kuwait, the sovereign fund (the General Reserve Fund) cannot be used for strengthening the research and innovation capacity and the Kuwait Investment Authority (KIA) has no specific mandate for using the funds to enhance the Kuwaiti knowledge economy, apart from the annual budgeting process. When investment in technological assets are made, these are chosen exclusively based on financial prospects. Exits can be done in the very short term (days) or long term (decades) depending on the evolution of their value. As for the Future Generation Fund, no investment can be made in companies within the Middle East and North Africa region. A positive sign was given when the KIA was asked to finance the National Fund for SMEs with the General Reserve Fund.

One contribution is through the KIA's subsidiaries, with the National Technology Enterprises Company[8] in the first place. Its mandate is, however, limited to international technology transfer.

To some extent, KFAS' levy is a form of innovation-related corporation tax, which largely relies on the oil economy. However, as previously mentioned, its budget is small relative to its portfolio of activities.

The necessary increase of the STI budget will require significant reforms of the budgetary framework

The Blue Ribbon report's recommendation to raise the level of R&D expenditures to a minimum of 1% of GDP within five years (hence around 2012) and 2% of GDP within 10 years (i.e. by 2017) involved an increase in R&D expenditure by a factor of eight.[9] Although the Blue Ribbon Panel did not have a strong constituency able to bring influence to bear on the government, it had some effect since the 2010 Mid-Range Development Plan set the goal of achieving 1% of R&D intensity by 2013/14. However, this recommendation stood little chance of being achieved, as few developing countries exceed 1% of R&D intensity, with the bulk of national investment in R&D coming from the business sector. In developed countries, too, the bulk of national investment comes from the business sector, which is far from being the case in Kuwait, as confirmed by the R&D and Innovation Survey undertaken in the context of this Review. A rapid expansion of R&D spending is also very difficult to implement efficiently, due to the long lead times needed to build up the human capital necessary to spend these funds efficiently.

A significant increase in the government budget for R&D (and promoting private investment in R&D) would also require a change in the budgetary framework:

- The current *ad hoc* and very bottom-up process, whereby the budget is populated on a project/item basis, submitted by the different ministries and institutions (such as KU and KISR) to the Ministry of Finance cannot lead to a major and sustainable increase.
- The organisation that is currently the closest to being a research and innovation agency – KFAS – can only access funding from the government through competitive bids and is not entitled to any systematic institutional funding – which could fund a more public mission that could be allocated

to it. Moreover, its current "business model" based on a levy paid by affiliated companies is increasingly contentious.

- KU's and KISR's institutional funding is allocated on a yearly basis and has fluctuated significantly, undermining necessary mid- and long-term planning and investment. It has also become increasingly subject to administrative burdens and rigidities that hinder research activities. Moreover, it is provided as a top-up to external funds acquired by these organisations, so that any increase in external funding is counteracted by an equivalent decrease in institutional funding. Not only is this practice a major disincentive for winning external funding, but also it reveals a purely financial, rather than strategic, perspective underpinning research funding.

1.4.4. Science, technology and innovation policy implementation

State-owned companies do not play a significant role in research and innovation

The government has limited leverage over business R&D via the state-owned enterprises (SOEs) – there are not many of them and they focus on low R&D-intensity sectors. The government's main opportunity to use the SOEs to promote innovation, then, is via the KPC. As with equivalent companies in resource-based emerging economies (e.g. the PDVSA in Venezuela and Petrobras in Brazil), it is something of an "island", with R&D strongly connected to multinational technology providers and oil companies, but with little R&D inside Kuwait. Ambitious plans to develop research capacity in the oil companies have been cut drastically, which tends to indicate their low level of priority in the overall strategic plans of these companies.

While Kuwait may have fewer opportunities to use SOEs as agents of innovation policy than some other countries, opportunities nonetheless exist and appear currently to be underexploited.

The lack of an overall STI policy and the limited STI awareness and capabilities in field ministries do not allow them to effectively contribute to the development of the knowledge economy in Kuwait

The STI projects in sectoral ministries are carried out without a dedicated STI policy, which hinders their effectiveness and contribution to the achievement of the overarching national goals. According to information collected through interviews, ministries' direct interventions are initiated in a rather bottom-up way, via direct interactions with companies in their respective areas and research institutions (KISR mainly in all areas, the Dasman Diabetes Institute and the Jaber Al Ahmad Centre in health). Several ministries' projects are carried out, at their initiative in most cases, within the framework of the MRDP. However, this does not compensate for the lack of a proper STI policy with a strong direction towards clear targets to serve the overall national overarching strategy.

Ministries do not generally have any department nor staff in charge of managing innovation. Managers in research institutions emphasised the lack of interest of ministries for STI projects that were submitted to them and their conservatism, often said to be related to a risk-adverse culture and the pressure of stringent budgetary and auditing rules. These are inconsistent with the inherent uncertainty of research and innovation activities and the flexibility and autonomy needed for their implementation.

KFAS remains limited by its small scale of operations to fulfil its multiple roles

KFAS plays at least three crucial roles in Kuwait's research and innovation system: 1) science communications; 2) research funding; and 3) innovation support.

The science communications task is important in all countries, but especially so in a society that is still transitioning towards a knowledge economy and where current political and policy decisions do not yet reflect the economic importance of research and innovation in development. Part of the task comprises

publicising, explaining and trying to increase the public's enthusiasm for science. Another element is encouraging the use of research evidence and rationality in decision-making, thereby supporting the functioning of democracy. KFAS also lobbies for science and research and directly influences specific government policies – as some of the leading scientific academies do, for example in the United States (the National Academies), the United Kingdom (the Royal Society and the British Academy) and the Netherlands (the KNAW). These are difficult tasks, and ones whose effectiveness is hard to measure. They are nonetheless very important. A major risk for KFAS is that it's other roles crowd out these important activities.

KFAS' role as a research funder and an innovation support body is in other countries tackled by research and innovation agencies, most often as separate organisations, however with different scopes and governance arrangements. For instance, the United Kingdom Research and Innovation (UKRI) is a governance umbrella that gathers the seven research councils, Innovate UK and Research England; the Research Council of Norway has an extended scope from basic research to research-based innovation and multiple functions (including operating the tax credit and the funding of several research institutes; in Singapore, the Agency for Science, Technology and Research (A*STAR) governs several research and innovation support bodies. These wide entities aim to consolidate and better co-ordinate the different funding streams. In Kuwait, KFAS has, in practice, taken on the roles of both a research agency and an innovation agency. However, it remains limited by its small scale of operations and does not have the financial means to be fully effective in either of these roles.[10] KFAS also plays a particularly important role in one of its growing priority areas: health research. In co-operation with the Ministry of Health, KFAS is a funds research initiated by physicians in hospitals through its calls for research proposals. The Ministry of Health does not have a budget for funding research in hospitals, but it provides in-kind resources (including physicians' time).

1.5. The higher education and research system

A higher education and research system is instrumental for not only supporting the national production of knowledge and economic innovation, but also for strengthening the country's absorptive capacity of international knowledge and maintaining links to developments in world science and technology. This function of science is particularly important for smaller countries and countries at a relatively early stage of development of their innovation capabilities to support the catch-up process. Higher education and research activities should be performed, as noted in the previous section, under the guidance of cascading strategic frameworks, from the overarching national strategies down to the strategies of each institution, in turn translated into college, department or sector action plans. This process is oriented and supported by public funding using mainly block institutional funding and competitive project funding and by different policy instruments and regulations.

This section presents the main conclusions of the assessment of higher education and research institutions' performance, research capacity, funding mode, and governance structure. Recommendations as to how these institutions' activities could best contribute to the country's knowledge-based diversification are presented later in this chapter.

1.5.1. Research and higher education institutions' performance

Research and higher education institutions (HEIs) have the increasingly difficult task of being ubiquitous: they must deliver excellent research globally and still provide the relevant knowledge and skills (embodied in graduated students, trained adults, technologies, community services, start-ups, etc.) that will serve national needs of government entities, business companies and more generally the civil society.

Research excellence: While innovation does not always need to draw on scientific knowledge, it is nevertheless clear that innovation, especially at the frontier, increasingly depends on scientific progress. Advances in science increasingly determine advances in technology, as illustrated by developments in information and communication technologies and, more recently, biotechnology and nanotechnology, where science and technology are intertwined. As many countries pursue a knowledge-based development trajectory in which research holds a key part, competition in science has increased dramatically in the last decades and has now become global. Besides the relevance to local and national needs, scientific excellence can only be understood – and assessed – on an international scale.

Effective and relevant teaching: The original and often unique mission HEIs created before the 1990s, in Kuwait as elsewhere, is still their main role, although research is becoming increasingly important (for instance for their evaluation and ranking internationally or to assess their staff internally). An adequate supply of individuals qualified at a higher education level is indeed a key factor in enabling economies to shift towards higher levels of knowledge intensity and allowing industries to move up the global value chain and, in the case of economies like Kuwait, transition towards the knowledge economy. Internationally, increases in higher education graduate rates have typically gone hand in hand with improved adoption and absorption of technological and process innovations, advances in productivity, and the wealth creation associated with this. These developments are driven by not only the advanced subject knowledge students acquire through higher education, but also the wider transversal skills sets they are able to develop through pursuing their education to a higher level.

The basic education system is generally well-funded, but still does not provide enough quality students to higher education, in particular in science and engineering

Although the focus of this Review is on research and innovation, the provision of higher education is also a key component of the assessment, since investment in human capital is crucial for innovation, technological development and long-term growth. Kuwait has recognised the importance of education in its planned development trajectory, as evidenced by official strategic documents (e.g. the Kuwait Vision 2035 and MRDPs) and, more concretely, high government spending in education in regional and international comparison. This has not yet translated into better education outputs, as measured by the literacy rate of teenagers or performance in international mathematics and science tests – Kuwaiti children achieve some of the lowest scores in the TIMSS international comparison. While high government expenditures have enabled good learning conditions in primary and secondary education (notably the combination of high enrolment rates and a low pupil-teacher ratio), the quality of teaching seems to be rather poor, as assessed by Kuwaiti citizens according to the World Economic Forum (Schwab, 2019). A comprehensive reform of the primary education system is addressing the issue by reforming curricula and introducing a competence-based approach to replace the legacy system of rote learning. However, secondary education is yet to be reformed.

In higher education, KU's student-staff ratio is at the unfavourable end of the range seen internationally, with one academic staff member for 24 students, which is less favourable than for other universities in the region, with major universities in neighbouring Saudi Arabia and the United Arab Emirates averaging a ratio of 7-10 students per faculty (Times Higher Education, 2019). Moreover, class sizes at KU are said to have grown in many cases to exceed agreed limits, as a result of a decision by the ministry to increase student numbers by 2 000 without increasing faculty numbers. The PAAET's staff-student ratio is similar to that of KU.

Another concern, especially when it comes to the contribution of education to research and innovation, is that the proportion of pupils that continue into higher education is modest in international comparison. Moreover, students in Kuwait (Kuwaitis in great majority) are less inclined than in other Gulf and OECD countries to opt for degrees in science and engineering and tend to cluster in education studies or administration and law. At KU, for instance, teaching activities are dominated by the social sciences and

humanities (which accounted for 70% of its 36 287 students in 2017/18). At the PAAET, only 20% of the 39 156 students are in the faculties of technology studies or health science.

This problem is not new, and institutions such as the Ministry of Education and KFAS are making significant efforts to increase public awareness in favour of scientific education and culture and bring the quality of teaching closer to international standards, notably in STEM education (see below).

Kuwait is losing ground in international and regional competition for excellent research

Using a wide array of indicators, different international rankings show that Kuwait's universities are positioned at low levels on many respects, and in particular with regard to research performance. The 2020 and 2019 THE placed KU in the range 801-1 000 (down from the rank 601-800 in 2018) globally, well below King Abdulaziz University in Saudi Arabia (201-250), Khalifa University in the United Arab Emirates (351-400) or Qatar University (401-500) (Times Higher Education, 2019).

A bibliometric analysis of research and HEIs' scientific outputs support this overall assessment (CWTS Leiden University, 2015). The volume of scientific production in Kuwait (the bulk of which originates from KU) shows a clearly increasing trend, as seen in almost all countries worldwide. However, it grew at a much slower rate than in many countries between 2000 and 2018, including other Gulf countries on average, leading to a decrease in its world ranking in terms of number of publications normalised by the population. Kuwait's share of publications in all Gulf countries has also fallen sharply, as countries like Qatar and the United Arab Emirates developed their research capacity during that period.

Even more worrying is the low quality of Kuwaitis' research in global comparison, as measured by the proportion of documents published in the world's 10% most-cited publications. This suggests a particular deficit at the highest levels of research. Kuwait is also among the worst or close to the worst performers in the GCC in terms of international research collaboration since 2007, after it had performed much better in the late 1990s. These collaborations have – in Kuwait as in most other countries – a positive impact on the research quality.

1.5.2. Higher education and research institutions' research capacity

Universities and publicly supported research centres form the backbone of national higher education, research and innovation systems. These institutions play a particularly important role in research and innovation, not only in equipping people with high-level skills and performing basic and applied research, but also in creating, sharing and exploiting knowledge of direct benefit to the wider economy and society.

Universities increasingly face the challenge to balance their different missions (often in a context of tight budgets) and to ensure linkages between these activities so that they mutually benefit each other. In many OECD countries, higher education and research institutions try to achieve sustainability by specialising in certain fields and areas. They therefore strive to profile themselves in areas of activity where they are strong – or have clear potential to be strong – and to differentiate themselves from other institutions. Governments in several countries support this process, for instance through the establishment of performance contracts or providing dedicated funding for strengthening the strategic profiling of universities in order to improve their capacity for enhancing the quality of research, as is the case in Finland through the Academy of Finland. Universities are invited to apply for funding with concrete plans for improving the conditions for high-quality/high-impact research, detailing proposed profiling measures with clear schedules for each step. In Norway, research institutes are engaged in direct dialogue with the Research Council of Norway in order to develop plans to improve those with below-average performance.

Higher education institutions' research capacity remains insufficient to contribute to Kuwait's transition towards a knowledge economy

The main HEIs in Kuwait, in terms of number of students and amount of research performed, are KU, PAAET and some 12 private universities, of which at least 7 perform research (for instance the Gulf University for Science and Technology, the Australian College of Kuwait and the Kuwait College of Science and Technology), while others are purely teaching universities.

As the primary and initial mission of these institutions is teaching, their research capacity is directly determined by the proportion of faculty that is "research active" and to what extent. As many other universities have found in making the transition from being a teaching university to a research university, the teaching culture tends to persist and it is hard to find time or resources for research unless strong incentives and proper conditions are in place to support this shift. KU, for instance, was established in 1966 and performed very little research until research activities were added to its mission in 1979. Currently, about 1 600 KU academics are expected to dedicate 30% of their time to research as per an informal university rule. However, data on research activities (publications and research project per staff), backed by interviews with university officials, tend to show that not all faculty is engaged in research at that level.

Such behaviour is probably linked more to the persistent teaching culture and the lack of an effective incentive structure, rather than the actual teaching load, which is similar to other countries like France, where professors find much more time to dedicate to research. At PAAET, where the teaching load is higher, the lack of flexibility to shift the teaching/research balance, for instance by buying-out some time with project grants, is an impeding factor.

The main incentives in place to encourage KU academics to engage in research are related to career advancement, linking promotion to an associate or full professor tenure to publishing a certain number of articles, as well as overall performance in teaching and outreach. However, there appears to be little motivation for individuals to seek promotion nor, once they have been promoted to a professorship, incentives for them to continue doing research. Financial incentives were, recently introduced at KU and PAAET for faculty members who publish in highly cited journals. International experience casts doubt on the effectiveness of such incentives to maintain a sustainable and systematic research effort or to spread research culture in the longer term. Studies tend to show that career incentives and institutional incentives (e.g. using different types of performance-based funding of universities) are more effective than individual incentives in strengthening the research capacity, in terms of both volume and quality (Franzoni, Scellato and Stephan, 2011; Arnold et al., 2017).

Involvement in research in other universities where research features less prominently in their mission – or not at all as in the case of PAAET – is even more modest. However, it is increasing at PAAET and in some private universities (as shown by the increase of their respective volume of publications). A small but growing number of private universities are doing some research and are able to win KFAS research grants in competition with Kuwaiti organisations such as KISR and KU. Some of them, such as the Gulf University for Science and Technology, reached a level of publications per staff similar to that of KU, although their teaching load is higher. These activities remain, however, small at the national level in terms of amount of research performed and results obtained.

Because of the long-standing "Kuwaitisation" policy, expatriates account for a small number of academics at KU and PAAET and their role is in most cases essentially to enhance capacity and fill gaps for a limited period of time, rather than strategically build specific capabilities in universities' priority areas. This is very different from the practice in countries that are highly successful in research, such as Sweden, Switzerland, the United Kingdom and the United States, as well as small countries like Luxembourg, which encourage a high inflow of talented foreigners into faculty positions and usually make it possible for them to become citizens. In effect, they exploit a talent pool that is much bigger than their country could provide.

A recent survey of academics from business colleges in Kuwait shows that non-Kuwaiti academics are more satisfied than Kuwaitis when working in private universities, but less so when working at state universities (Al-Mutairi, Naser and Al-Enezi, 2017). This is due to the much lower job security, since they are not eligible to get a tenured job in one of the state universities, a factor which often makes them go to another country, frequently in one of the neighbouring GCC countries, which offer better conditions. Changing this single provision would make state universities much more attractive, because non-Kuwaiti staff are actually very satisfied with most of the other dimensions, including the sense of achievement, ability utilisation, creativity, independence, social service and social status. Other issues that need improvement for both Kuwaiti and non-Kuwaiti staff include opportunities for advancement, recognition of work well done, and implementation of the universities' policy and practices.

This is all the more problematic since a significant number of non-Kuwaitis will retire in the coming years. It is not clear whether there is sufficient capacity to train enough Kuwaiti researchers with the relevant competencies to replace them.

KISR is still far from achieving its objective of becoming the "region's most highly respected STI and knowledge gateway" and an "international centre of excellence" by 2030

KISR, created in 1967, was for many years the only research-performing institution in Kuwait and is still by far the largest applied research institution, in both scale and scope.

KISR was last evaluated in 2000 and no evaluation or review of it in recent years provides an updated overview of its current performance. Most of the recent data originating from its monitoring system and other sources support the idea that the amount of research activity has increased. However, despite significant efforts, there has not been any major improvement in the field of research commercialisation in recent years, partly due to the fact that KISR still operates in a challenging environment (small private sector, limited innovation awareness and capabilities of potential public clients):

- The number of publications monitored by KISR has remained rather stable in recent years, following a significant increase between 2013 and 2015. The number of publications (overall and for publications in highly cited journals) remains below the Institute's annual targets in 2017/18 and 2018/19 (except for co- publications with international partners).
- The number of research projects completed has increased significantly since 2012/13.
- The number of contracted projects has more than doubled between 2016/17 and 2018/19, but the total value of contractual research in 2017/18 is slightly under what it was in 2013/14 (and below KISR annual KPI target). The value of research grants obtained competitively from KFAS does not show significant improvement since 2014 (albeit in a context of decreasing KFAS allocated grants since 2016), although the institution represents about half of KFAS R&D budget.
- The number of patents granted has increased in recent years, but remains small for an organisation of this size (eight in 2017/18 and 5 in 2018/19). For comparison, in a very different environment, MIMOS Berhad, an IT research institute of less than 900 employees in Malaysia, filed 87 patents in 2017.
- KISR has still not received any revenues from licensing patents. Apart from project grants and contract research, KISR's external revenues come mainly from services to various ministries, not from research commercialisation. At the time of writing, KISR's Commercialisation Policy still had not been enacted.

However, this report is not an evaluation of any specific Kuwaiti institution, not even one that account for almost all the national applied research capacity. The mixed performances highlighted above find in great part their roots in the environment in which KISR operates, notably a very small private sector, a limited research and innovation budget and the absence of a dedicated national innovation policy to steer a collective effort in this area.

KISR has undertaken significant steps to counter long-established structural weaknesses, but concrete and significant results are still to materialise – and be evaluated

An evaluation of KISR in 2000 and the KRRP review in 2007 revealed issues hindering KISR's ability to deliver on its objectives. They pointed notably to the process of Kuwaitisation that affected KISR's access to expertise in some crucial areas, to issues with project management and managerial leadership. Despite the time lag between these exercises, both concurred that the institute had issues with research commercialisation and more generally the ability to engage adequately with customers. Among the main external factors hindering its ability to successfully achieve its mission was the need for improvement for ministry oversight and the lack of a national STI policy, which slowed down KISR's efforts to devise its own strategy and to maintain a division of labour with others doing research in Kuwait.

Since then, KISR has engaged in the "KISR Transformation" project, which has entailed a significant reorganisation, clarification of processes and the introduction of strategic planning tools during the period 2010-15. One key dimension of this initiative was the gradual shift from a traditional R&D organisation serving the current needs of clients – ministries and oil companies for the most part – to a more forward-looking and result-oriented organisation. This ambitious project faced some staff resistance, which significantly delayed its implementation. Concretisation of this endeavour were, for instance, the creation of the STS Sector and the Marketing and Commercialisation Sector. Some related initiatives were still being rolled out in 2018, such as the creation of a high-level internal scientific advisory committee. The evaluation of the "KISR Transformation" project is currently performed internally as part of the preparation of KISR's 9th Strategic Plan.

Interviews conducted with some of its main public and private partners as part of the current Review show that despite significant internal reforms, KISR still needs to significantly improve its organisation, processes and culture. The most frequent limitations emphasised by several of its corporate partners are: the difficulty of concretely co-operating with KISR due to insufficient result orientation and commercialisation focus; modest capabilities and insufficient equipment even in an area like petroleum research; insufficient focus leading to undersized engagement and underperformance in priority areas such as desalination. In no way should this list be deemed exhaustive or representative. However, it provides some information on the perception of KISR by external partners. They generally also emphasise that the budgetary and regulatory environment in which KISR operates as a government organisation – without exemption related to the specificity of research activities –may lead to suboptimal outcomes.

Although KISR management (central and at department/centre level) points to the progress accomplished, it also in majority supports the idea that the long-awaited transformation is still underway and will require more time. Like their partners, they emphasise the external factors that could be improved in order to improve KISR's potential to drive further development of the Kuwaiti economy:

1. establishment of a clear national STI policy to guide their activities and of a commensurate and stable budget to fulfil strategic objectives
2. stronger absorptive capacity in both the private and the government sector
3. easing the burden of bureaucracy and increasing the level of operational autonomy through simplification of regulations and procedures (e.g. related to recruitment, budgeting, equipment purchase) that may lead to red tape, delays and rigidities
4. enhanced ability to recruit and retain skilled staff due to opportunities offered by industry, notably in the oil sector, where salaries are higher
5. improvements in strategic planning and ability to implement priorities (see infra sub-section on "governance").

An internal review of KISR's operations and achievements was performed as part of the preparation of its 8th Strategic Plan (2015-20). It emphasised insufficiency of manpower and, in particular, experienced

researchers; challenges in addressing clients' specific needs; limited priority-setting resulting in a long list of planned research activities; and the burden of internal processes such as procurement and recruitment, resulting in long delays (Arman, 2017).

Despite progress in recent years, KISR may still be seen as too "inward-looking". In some areas (water desalination, for instance), it has implemented new practices for engaging partners, notably ministries, earlier and on a continuous basis in their projects, in stark contrast to the traditional supply-push approach. These initiatives could be assessed and, if deemed beneficial, promoted internally.

KFAS centres have improved following comprehensive evaluations, but there is still room to make them more effective and efficient.

KFAS manages two external centres with significant research activities: the Dasman Diabetes Institute (DDI) and the Jaber Al Ahmed Centre for Molecular Imaging and Nuclear Medicine.[11] The 2014 Strategic Review of KFAS concluded that these centres were consuming a large and growing proportion of KFAS' total disposable funding and that the foundation seemed to have limited control over these centres due to management and governance mechanisms in need of improvement. In response, KFAS and the centres initiated important internal reforms to improve their performance and strategic focus.

KFAS also engaged in negotiations with the Ministry of Health to try to at least share the governance and funding of these centres, with some success. An agreement has been found, whereby the ministry supports the centres with in-kind resources. However, these research centres still represent an important component in KFAS' budget in a context of increasing pressure on resources and growing demand for its support services. A refocusing and formalisation of KFAS' role as a research and innovation agency would make the question of the relevance of these centres under KFAS' purview even more pressing. It is not uncommon to have research agencies funding research institutes (i.e. Norway), but this is done with governance arrangements (for instance, via performance contracts) that ensure the strategic orientation of these institutes by the funders, a sustainable budget by public authorities and the operational autonomy of these institutes to fulfil these objectives.

DDI was set up on the instructions of the Amir in 2006 and funded by KFAS. It was intended to provide a combination of diabetes research and public education about diabetes, in an effort to reduce the very high prevalence of the disease in Kuwait. A peer review in 2014 expressed concern about the lack of focus and orientation towards specifically Kuwaiti problems in the institute's research strategy. As in other institutions in Kuwait, its research agenda appeared more as a bottom-up collection of individual researcher-led projects than driven by an overall strategy from the top, leading to dispersion and sub-scale research in a very competitive global environment. It urged reform, and the separation of treatment from research, with the Ministry of Health to take over the costs of treatment. Since then, a change of leadership, the development of a research strategy and significant restructuring has enabled refocusing the institute, and the Ministry of Health has agreed to take over treatment costs. Recent data tend to show some significant improvement in terms of volume and quality of research activities, which are yet to transform into innovation results.

JAC is a facility for advanced medical imaging and the production of a radioactive isotope used in imaging. It provides diagnostic services for the Ministry of Health and carries out a very small amount of research. For this centre as well, KFAS has initiated discussion with the Ministry of Health regarding the preparation of a sustainability plan to provide viable alternatives to handing the centre back to the Ministry of Health and developing a research strategy.

1.5.3. Research and higher education institutions' funding

Government funding of research activities is not only a way to cover – partially or fully – the costs related to the public mission of advancing knowledge, contributing to innovation and supporting economic and

social development, it is also a way to steer these activities towards national priorities. Public funding of research institutions is therefore used as a financial incentive to drive institutions' activities at different levels (the institution as a whole, the faculties and departments, teams, and individual staff) towards achieving their objectives.

Most countries use a combination of institutional funding for longer-term research and project competitive funding. Institutional funding is distributed within institutions according to specific modalities, depending on their internal strategy and the way this funding was allocated to them. An increasing number of countries (Australia, Norway, Spain, the United Kingdom, etc.) link the institutional funding of research and higher education institutions to their performance (e.g. performance-based institutional funding) and their future plans (e.g. performance contracts), while still providing a stable funding base (funding based on size and history). Project funding is provided most often through competitive tenders through funding bodies of various types and forms, such as research councils, science foundations, innovation agencies, as well as ministries themselves. Such bodies fund research relevant to their specific responsibilities (such as general scientific knowledge, health, transport, environment, etc.). Considerable operational knowledge on the best practices for conducting competitive funding of research has been accumulated in the last two decades.

Government funding for research institutions is marginal and unstable

The institutional funds provided annually by the government to KU and KISR, the two main research institutions in Kuwait, have been very volatile in recent years, hampering mid- and long-term planning, which is essential for such activities.

At KU, the overall budget has stagnated since 2013/14 (and its operational budget severely declined in 2015-17) despite rising numbers of students. Nevertheless, according to the International Monetary Fund, spending per tertiary student remains high in international comparison, about 60% above the GCC average, and more than double the OECD average (IMF, 2018).

The institutional budget dedicated to research (not including staff cost) dropped drastically during the period 2013-17 and tended to be 1-2% of the operational budget, which reflects that research is still not seen as a priority, not only by the Ministry of Finance but also, as claimed by faculty members, by the University Council and leadership. Even when accounting for staff costs, using the assumption of 30% of faculty time spent on research (according to an informal but well-known rule in place at the university) – which is, however, lower in practice – the research budget remains small (7% of the operational budget of the university in 2017) (discussed in more detail in Chapter 2, see Table 2.3). While the university points to the budget restrictions imposed by the Ministry of Finance, the Ministry of Finance stresses that some planned research expenditures were not realised, due to the limited research capacity of KU. In turn, low research budget execution can find its roots in both the limited research capacity of KU and the many bureaucratic restrictions that hinder research activities. While there is not sufficient evidence to disentangle this issue, the faculty interviewed highlighted the devastating effect on its motivation.

KISR's budget is also very volatile and fell by more than half in 2018/19 relative to the previous year. Annual variations are mainly related to large construction projects and, to a lesser extent, to some wave of government projects related to the national plans. However, even when excluding the cost of construction, KISR's institutional funding in 2018/19 (KWD 47.3 million) was slightly lower than what it was in 2013/14 (KWD 51.2 million). Its external income (including research grants and contracts, as well as various types of technical and advising services) between 2014 and 2018 was 9-16%. This compares to about 65-70% in equivalent organisations in continental Europe, and 85-90% in the Nordic countries.

According to available data, research accounts for a very small portion (0.06%) of the PAAET's total annual expenditures.

The mode of allocation of government research funding generates major inefficiencies in research planning and implementation

The institutional funding provided to KU and KISR is based on budget lines and is directly negotiated with the Ministry of Finance, without any formal relation to past performance (apart from budget execution) and limited consideration of the plans of these institutions. Moreover, the recent imposition of more fine-grained budgeting exacerbates the financial problem of these institutions and impedes strategic flexibility. KU's budget, for instance, which formerly had eight lines specified by the ministry, has now been restated in some 2 000 budget lines among which it is very hard to reallocate resources. This goes against the current trend of increasing autonomy and performance-based governance and funding of universities in many countries.

The tighter control of the civil service commission and auditing services results in delays in the procurement of goods and the recruitment of staff, and consumes a great deal of effort. Bureaucratic procedures also constrain these institutions' ability to respond to external calls. For instance, KISR cannot respond to a call for tender if the amount was not foreseen in the previous budget. Voluntary contributions are also subject to approval by the Ministry of Finance, which slows down KISR's responses to external offers and hinders co-operation with industry.

Finally, external funding of both KU and KISR is deducted from the institutional funding provided by the government, so that there is no monetary incentive to do research. All staff efforts to secure external funding therefore result in extra work to implement the related projects, without funding to cover the related additional costs.

The absence of a proper research agency for allocating competitively research funding impede improvement in quantity and quality of research

Through its Research Directorate, KFAS supports the advancement of science and research in Kuwait in different ways, mainly through the allocation of research grants, but also through its support to researcher and research institutions' capacity building and networking.

Besides the institutional funding received by each institution, KFAS is the main source of external funding of applied and, to a lesser extent, basic research in Kuwait. It manages a portfolio of grants, which respond to different needs and are adapted to various project sizes. A 2014 peer review of KFAS noted a "pattern of performance improvement" of its research grant scheme and called for further efforts to improve its efficiency and impact. In recent years, KFAS has made significant efforts to improve its efficiency. The Research Directorate has streamlined its processes and adopted proposal assessment and selection measures, based on standard international practice in the form of national and international peer reviews. These efforts have had some results, as evidenced by the significant decrease of its management cost ratio, now close to those of research funding organisations in leading OECD countries. KFAS' impact is more difficult to assess in the absence of recent studies and because the performance of KFAS-funded research reflects, largely, the weakness of Kuwait research as a whole. A bibliometric analysis performed on the period 2002-13 showed that KFAS-funded research projects were of lower quality (as assessed by citations) than those of other funding bodies in the GCC, such as the King Abdulaziz City for Science and Technology in Saudi Arabia.

As previously mentioned, KFAS' broad mandate and limited budget hinder its performance. Its total contribution to research projects through grants and their average size has decreased since 2015 (and so has its overall budget since 2014). This has raised concerns among its senior management as to whether the foundation can still have a real impact. Researchers also emphasise the importance of this complementary and less bureaucratic source of funding, as they are asked by their respective institutions to increase their engagement in research activities. Most KFAS-supported projects receive co-funding (often reaching over 50%) from the beneficiaries themselves (in particular in the case of KISR), hence a

rather high leverage effect, but a rather weak incentive for collaboration since projects seem to be mainly composed of one participant. The vast majority of other research projects are funded internally by HEIs and research institutes (as part of their internal calls for proposal), which means that they are not exposed to external competition and less frequently to the demands of an external client.

While KFAS allocates most of its research funds competitively, it also supports more top-down and strategic so-called "flagship project programmes" that address more directly national priorities (for instance, funding provided to KISR in water or renewable energy). It, however, has neither the necessary resources nor the mandate to accompany these projects beyond pilot demonstration and support the scale-up of these activities. The transfer of successful pilots to ministries has sometimes caused long delays or projects to be dropped altogether.

Due to its hybrid quasi-public status, KFAS has been increasingly subject to two types of pressure. On the private sector side, its "shareholders" exert a growing pressure to diminish the levy that finances its budget. On the public sector side, it is asked to serve national interests by accepting to fund and manage government initiatives that divert it from its core mission – the one that in most other countries fall under research and/or innovation agencies.

This problem can only get worse as the system grows and the national need for research funding increases. A government decision is needed about how and where to create a research council in Kuwait. The issue of the creation of a national research agency with government funds – and of the evolution of the role and status of KFAS in this new landscape – will therefore inevitably arise. Having performed a similar role since its creation, KFAS has accumulated the experience, formalised process, reputation and network of experts needed within a research-funding agency.

1.5.4. Research and higher education institutions' governance

KU's governance arrangements are not conducive to setting priorities or to making difficult choices

A large council, chaired ex officio by the Minister of Higher Education, governs KU. The Under-secretaries of Education and Higher Education are members as are three eminent Kuwaitis who represent the government sector and another three from the private sector. The university president, secretary general and 17 heads of faculties are members, so there are 19 university and 9 societal representatives in a body of 26 people. The colleges are largely self-governing, without external representatives.

These arrangements allow for some societal influence on the university's overall direction, but this influence is reduced due to the power of colleges, where academics play a strong role. Over the past three decades or so, European universities have – at varying speeds and under different forms – been moving from collegiate governance to executive governance with societal representation. The board, with a majority of societal representatives, sets the institution's strategy and appoints the rector, while academic aspects of governance is left to the academics. This shift in strategic power away from individual departments and colleges has allowed "smarter" orientation and profiling of universities.

The KU Strategic Plan for the period 2013-17 was detailed and comprehensive, although – as in many university plans – it was perhaps too ambitious and no option appears to be left out. It clearly indicated that many of KU's difficulties were well understood internally, recognising the need for improvements in many dimensions of university performance and monitoring progress assiduously. A simple comparison between objectives of the 2013-17 strategy and apparent achievements shows significant gaps in many respects (in higher education and in research). Some decisions – not all pertaining to KU – have even been contrary to the thrust of the strategy. One example is the Ministry of Higher Education's requirement for KU to take 2 000 extra students without allocating any extra budget, whereas the objective was to

improve the student-to-faculty ratio. Similarly, neither graduate studies nor research has expanded significantly during the period, in stark contrast to the strategy's goals in that respect.

In contrast with its predecessor, the current KU Strategic Plan 2018-2022 is a very concise document, presenting some generic objectives and goals. This overall plan was then completed by the different units proposing their project under each large heading. Such a document may prove insufficient to provide the necessary strategic guidance to balance the powerful bottom-up dynamics that characterise higher education institutions, in Kuwait or elsewhere. This strategic plan was rarely referred to during interviews and appeared to have a limited impact as an authoritative and inspiring strategic framework of reference.

KISR has a well-established five-year strategic plan, but its governance and strategic orientation process could be improved

KISR is governed by a Board of Trustees, chaired by the Minister of Higher Education. Other members represent major stakeholders, mainly in the government sector (Ministries of Planning, Oil, Public Works, Electricity and Water, etc.; Kuwait Industrial Bank). KFAS is also represented in the board.

KISR has developed five-year plans since 1979, with significant efforts put into improving strategic planning and correcting the former plans' revealed weaknesses, especially since the 7th Strategic Plan, albeit in a context of a lack of experienced staff. Each recent plan has been the occasion of a thorough, mainly internal, review of achievements and gaps. These used to focus as much on the development of KISR itself as on the delivery of technological and societal change. KISR involves its clients and stakeholders (Ministries, SCPD, government agencies, K-companies, etc.) early in its strategic planning process in order to identify their problems and focus on relevant solutions. Most of them (at the exception of KPC) however do not have a formal or even informal innovation strategy and their inputs can only be limited to drive KISR's activities. KISR's intention, expressed in the 8th Strategic Plan (2015-20), is ambitious, which states that KISR should become a regional centre of excellence by 2025 and an international centre of excellence by 2030, setting a continuity across the 8th, 9th and 10th strategic plans. The ongoing plan is very detailed, with a short synthetic overall report and comprehensive documents for each centre and sector. KISR also has a monitoring system with KPIs and annual targets, covering most of the dimensions of its activity.

All of KISR's board members are government employees. While these include representatives of ministries that control important parts of industry (such as oil, water and electricity) and which are important customers for KISR, the absence of private sector (and international) input at this level tends to reinforce KISR's inward-looking strategic perspective. KISR's strategy aligns easily with the priorities of the national MRDPs, since it works in the traditionally central areas of Kuwait's economy.

Moreover, the limited absorptive capacity and strategic intelligence in both government and business mean that KISR receives only relatively weak external signals about needs. The same factors make it hard for KISR to push advantageous changes through into practice on those occasions where it is able to propose significant improvements, as was, for example, the case in the early years of applying reverse osmosis in desalination.

In order to improve its strategic guidance, KISR will create during the course of the 9th strategic plan an Advisory Council constituted of four to six internationally renowned leaders in the field of science and technology. In addition, a dedicated Advisory Board, composed of representatives of relevant national institutions will be created to support the orientation of each KISR Research Centre.

Bureaucracy and rigidities are significant obstacles to doing research and innovation efficiently

Staff in all research and higher education institutions report that high levels of bureaucracy and inefficient processes place many obstacles in their way and prevent them from achieving their strategic objectives,

such as long lead times for obtaining equipment and permission to hire support staff, as well as low wages and short contracts for research support staff.

1.6. Business innovation

1.6.1. Framework conditions for innovation

A business environment favourable to starting and doing business is an important pre-requisite for boosting innovation. Innovation activity also requires medium- to long-term investment and planning over long product innovation cycles from idea to market.

A stable financial system is therefore crucial to ensure investment in innovation and adequate returns on investment, and a sound regulatory framework is conducive to the generation of new technologies and helps them be rapidly diffused. An appropriate education system is also necessary to provide the skills required by an innovative workforce. In addition, importantly, innovation requires technological prowess and a culture of experimentation and risk-taking.

Kuwait provides a stable macroeconomic environment, but lags behind on many policy dimensions critical to doing business

In spite of recent improvements, Kuwait has room for improvement in global rankings of its entrepreneurial ecosystem. In 2019, the World Bank's Doing Business ranked Kuwait 97th out of 190 countries, compared to 11th for the United Arab Emirates; for starting a business, Kuwait is ranked 133rd (the United Arab Emirates is 25th). Likewise, in the World Economic Forum's Global Competitiveness Index, Kuwait performs significantly below its GCC peers on dimensions relating to market competition, non-tariff barriers to trade and rules for foreign direct investment.

When asked about the most problematic factors for doing business, Kuwaiti companies quote: inefficient government bureaucracy; corruption; restrictive labour regulations; need for improvement of the work ethic in national labour force; and an inadequately educated workforce (Schwab, 2018).

In its four missions to Kuwait, the OECD Review team carried out more than 111 meetings, some of which were organised as focus groups with several parties organised by topic of interest. The team met with government entities (including ministries); research institutes; HEIs; public funds; non-profit organisations; business councils; and 47 businesses, including 9 financial companies, 4 logistics companies, 3 ICT companies, 6 oil and petrochemical companies, 4 electrical and machinery companies, and a number of companies from other manufacturing (medical, pharmaceuticals, chemicals, food, etc.) sectors. Five facilitator organisations such as incubators, accelerators and fablabs were also visited, and seven start-up companies interviewed. In those interviews, land was seen as an issue and a real barrier to growth, as getting industrial land at attractive locations is very difficult for non-oil companies. The cost of land is much higher than in neighbouring Saudi Arabia, and sometimes not available at all.

Standards and regulations are an issue. Getting a license is tedious and requires a lot of effort. Standards are not harmonised across the GCC and this causes issues with companies operating regionally. In the food industry, one bottleneck is the food and drug lab (only one for the whole country) and delays are very long (sometimes the product spoils before it is tested). In Saudi Arabia, private companies can get their labs certified and act as official testing facilities.

Companies are asking for a governmental strategy for diversification (e.g. in the petrochemicals sector), awareness-raising events such as a national STI conference, and national innovation awards. Companies mentioned subsidies available, for example, in Qatar for participation in international exhibitions, as well as subsidies for foreigners to come and visit the local industry.

When technological innovation is involved (e.g. in fintech), a regulatory sandbox is provided by Central Bank of Kuwait to facilitate innovation. Regulatory sandboxes are specific arrangements whereby regulations are made more flexible to accommodate an emerging technology whose impact has yet to be tested in order to determine the appropriate regulation for the future. Sandboxes provide for temporary flexible arrangements for a limited amount of time, in order to allow pilot implementation of innovative products or services. Access to finance is limited to bank credit, which is quite readily available. However, venture capital for start-up ventures remains scarce. According to interviews, there are few venture capital funds (Arzan, Faith capital and Impulse), but there is also a small number of viable start-ups, so it is difficult to expect massive influx of venture capital.

Education and skills gaps are a serious challenge to businesses

In spite of strong spending on education, the performance of the Kuwaiti educational system remains modest. As previously mentioned, Kuwait performs modestly in the TIMSS international measurement, both compared to GCC countries and much lower than the OECD average. Kuwaiti authorities are aware of this fact, and a reform of primary education is under way. Secondary education has yet to be reformed.

Concerning tertiary education, the World Economic Forum's *Global Competitiveness Report 2017/18* ranks Kuwait very low, with the quality of math and science education being ranked 106th out of 137 countries surveyed (compared to 13th for the United Arab Emirates and 6th for Qatar); availability of scientists and engineers 98th; quality of management schools 111th (15th for the United Arab Emirates, 7th for Qatar); and local availability of specialised training services 121st (24th for the United Arab Emirates, 22nd for Qatar).

The skills gap in Kuwait is particularly acute, and represents a strong hurdle which Kuwait needs to overcome. Several sources confirm this trend:

- In a 2008 survey, only 32% of the surveyed chief executive officers said that the education system provides people with adequate skills and 33% said those skills were provided in sufficient quantity (Mohammed Bin Rashid Al Maktoum Foundation and PricewaterhouseCoopers, 2008). This is the lowest percentage within the entire Middle East and North Africa region. Skills required by the chief executive officers were most importantly, communication skills, teamwork, analytical and critical skills, initiative, language skills, innovative and creative thinking, while memorisation skills were considered less important. On the other hand, curricula were considered to be based on theory rather than practical knowledge (for 71% respondents in Kuwait).
- In 2017, the Berkeley Research Group interviewed a limited sample of 35 entrepreneurs to inquire about the most important issues when choosing location, and talent availability ranked 4th after the market, lifestyle and government regulations. The score for Kuwait on the talent dimension was 3.8/10, and for Dubai 7.3/10. This was one of the weakest dimensions for Kuwait in this survey (Berkeley Research Group, 2017).
- The World Economic Forum's *Global Competitiveness Report* 2017-2018 confirms that work ethic and an adequately educated workforce remain two among the six most modestly performing factors for doing business in Kuwait (Schwab, 2018).
- Interviews carried out by the OECD Review team indicate that such skills gaps persist. Entrepreneurs confirmed that skills in IT, design and professional services remained very scarce, and caused many companies either to delocalise from Kuwait or to find arrangements such as teleworking at a distance in order to ensure the proper skills. In addition, it is difficult to attract expatriates to Kuwait, due to more attractive options elsewhere in the Gulf region.

Kuwait's labour market does not provide appropriate incentives for entrepreneurship

The labour market is very specific in Kuwait and presents a strong split between the private and public sectors, as well as a split according to nationality, with differing conditions for Kuwaitis and non-Kuwaitis. This is a disincentive for Kuwaitis to engage in the creation of new business ventures.

The job market duality is notably illustrated by the difference in monthly wages, with the average monthly earnings (including basic salary and various allowances) for Kuwaitis nine times higher than for non-Kuwaitis (KWD 1 113 vs. KWD 120 in 2015). This can only partly be explained by the difference in average education level. When comparing like for like education levels, the gap is still more than eightfold for the lowest levels of education: a Kuwaiti with primary education or below earns an average of KWD 850, while a non-Kuwaiti will make KWD 100. At university education level, the gap is still more than 2.5 times, with a Kuwaiti making KWD 1 350 and a non-Kuwaiti KWD 490, just above half of what an uneducated Kuwaiti makes (KCSB, 2015).

Part of the explanation for these wage gaps lies in the fact that most Kuwaitis work in the public sector, while expatriates work in the lower paying private sector. Kuwaitis choosing to work in the private sector will receive a monthly compensation to cover the wage differential, called "workforce support" (*daam amala* in Arabic).

A large majority of 92% of Kuwaiti nationals are employed in the government sector (86%) and state-owned enterprises (6%). However, a significant part of government jobs are occupied by non-Kuwaitis (about 100 000 positions, or 25% of the total government jobs, corresponding to about 8% of non-Kuwaiti employment). A majority of these non-Kuwaiti public sector employees work in the health and education systems. The private sector is the largest employer of non-Kuwaitis, employing 49.5% of non-Kuwaitis[12] and a minority (8%) of Kuwaiti nationals (KCSB, 2011).

Such a situation clearly affects the incentives for entrepreneurship and innovation. In particular, a Kuwaiti national considering an entrepreneurial venture has to forego lucrative employment in the public sector and create a company subsisting only on the "workforce support" stipend[13] until the company can generate revenues and sustain the entrepreneur. The National Fund can provide a loan, but not if the entrepreneur plans to bring a non-Kuwaiti on board and offer equity.

For non-Kuwaitis, the situation is even less appealing, since they need to find a Kuwaiti sponsor before they can even register a company, and even then, their equity stake is limited to 49%.[14]

Going forward, the labour market poses extraordinary challenges. While the Kuwaiti government has been able until now to allocate significant budgetary resources to the creation of public sector jobs for its citizens, it will become increasingly difficult to create enough public sector jobs for all the workers entering the labour market. According to IMF estimates, the unemployment rate of Kuwaiti nationals increased from 1% in 2000 to 4.7% in 2015.

Overall, Kuwaiti businesses are quite innovative, but R&D intensity remains low

In order to understand the innovation performance of the Kuwaiti business sector, a dedicated innovation and R&D survey was conducted in Kuwait in 2018 and 2019 on a sample of 2 326 companies, by the Kuwait Central Statistics Bureau (KCSB), with strong support from the KFAS and the SCPD, as well as a consulting company – GOPA. Even though the survey faced many challenges and does not meet the quality standards of reporting in OECD countries, it offers some initial insights (Box 1.2).

Box 1.2. The dedicated Kuwaiti innovation and R&D survey

Methodology

The Kuwaiti innovation and R&D survey was carried out by the Kuwait Central Statistics Bureau (KCSB) and the Kuwait Foundation for the Advancement of Science (KFAS) with methodological support from the GOPA consulting company, based on its experts' experience with the surveys conducted by the UK Office for National Statistics and within the Gulf region. The innovation part of the questionnaire was based on the European Community Innovation Survey model questionnaire using international guidance contained within the Oslo Manual (OECD/Eurostat, 2019). The R&D part of the questionnaire was based on the 2015 OECD Frascati Manual (OECD, 2015a).

Sampling

Quality issues exist with the list of businesses held by the KCSB. Consequently, all available companies in the KCSB directory with 20 or more employees were selected, amounting to 2 350 companies. This was complemented by a sample of companies with 10 or more employees sampled from the database of 4 427 available companies in total. The target sample was 3 000 companies. A total of 2 154 companies provided valid responses. An additional sample of 200 companies were taken at random from 270 companies that were said to be less than 10 years in existence provided by an independent provider – Cedar Rose. A total of 172 companies provided valid responses to this additional collection. The reference period for innovation and R&D behaviour were the three years 2015-17.

Results – Innovation

Overall, 43% of Kuwaiti companies confirm having innovated in either product, process, marketing or organisational structure in the three years 2015-17.

Only 21% of micro and about 38% of small companies innovate, while 54% of medium-sized and 72% of large[1] companies do.

Partially or totally state-owned enterprises report a higher rate of innovation (respectively 60% and 50%) than privately owned ones (42%). This difference can partly be attributed to the size, since state-owned enterprises are large enterprises.

Sectoral analysis shows strong innovation performance in the mining and quarrying sector (100% of a sample of 3 companies innovate). Significant R&D activity exists in Kuwait Petroleum Corporation and its subsidiaries[2] (in particular Kuwait Oil Company), based on co-operation with external partners such as Schlumberger, as well as the Kuwait Institute of Scientific Research. The Kuwait Petroleum Company is aiming at establishing its own full-fledged R&D centre by 2023. Among the services sectors, the most innovative is health and social work (75% of a sample of 16), followed by education (60% of a sample of 58), as well as recreational, cultural and sporting activities (56% of a sample of 16). In manufacturing, chemicals and chemical products companies are also fairly innovative, with 50% of a sample of 20, as was the food industry, with 47% of a sample of 88, while other manufacturing sectors are less innovative (below 40%). Among the least innovative sectors are furniture manufacturing and hotels and restaurants.

Among other expenditures relative to innovation, the most common ones were acquisition of machinery and equipment (42% of the businesses), design (19%), training (15%), and the acquisition of knowledge (12%).

Only 31 companies (representing 3.1% of the innovating companies) have received public financial support for innovation activities. Of these, 13 have been supported by the KFAS, 9 by the Public

Authority for Industry for customs exemptions, and 4 mentioned support from the Industrial Bank of Kuwait. Only one company mentioned the National Fund.

Co-operation in innovation

Among the innovating companies, about 14% have co-operated with an external partner, most often a partner located in Kuwait, and the partner is (in decreasing order of frequency): an enterprise within the enterprise group, a supplier, a client from the private sector, a client from the public sector, a consultant, a competitor, an academic partner from university or an academic from a public research institute. As far as foreign partners are concerned, they are most often suppliers from Europe or the People's Republic of China, an enterprise group in Europe or the Gulf Cooperation Council (GCC), or a client partner from the GCC. The most valued partners are suppliers (27%), enterprises from the same group (20%) and private sector clients (12%), followed by consultants (6%) and academic partners (6%).

Research and development

Research and development is performed by 21% of all enterprises and this percentage varies from 9% for micro enterprises to 36% for large ones. On average, the companies have 4.5 R&D employees, ranging from less than 2 in micro enterprises to about 8 in large companies. Average spending on R&D per company is about KWD 47 000 (USD 150 000), ranging from KWD 4 500 (USD 15 000) in micro to KWD 115 000 (USD 380 000) in large companies.

Likewise, a great disparity is found across sectors, with 67% (2 out of 3) of enterprises in mining and quarrying performing R&D, followed by 42% (5 out of 12) in the paper sector then chemicals (40%), health (38%), wood and paper (34%), education (31%), financial services (28%), and food and beverage (24%).

The role of intellectual property is marginal. Only 15 companies (less than 1% of the total) reported a patent application.

Note: Exhaustive results of this survey are presented in Chapter 5.
1. At the launch of the survey, there was no official definition of small and medium-sized enterprises in Kuwait (see Box 5.6 in Chapter 5). For the purpose of this survey, companies were categorised according to the number of employees: micro (0-9), small (10-49), medium (50-249) and large (250 and over).
2. Please note that these companies did not participate in the survey.
Source: Kuwait Innovation and R&D Survey, Kuwait Central Statistical Bureau, KFAS and SCPD.

The survey finds that 46% of the companies innovate and 21% of all companies perform R&D, albeit at a low scale (average size of R&D departments is 4.5 persons, ranging from 2 in micro companies to 8 in large ones). There is a certain volume of R&D in the oil sector, mostly performed by the public research institute KISR and through foreign partnerships. Kuwait Oil Company has a Research and Technology Division which does not do the mainstream R&D, but works with new and emerging technologies and technologies that need to be transferred in, such as the digital reservoir model, and using concentrated solar power to generate steam for enhanced oil recovery. In total, there are 81 projects worth about KWD 10 million per annum. They have partnerships with KU, the KISR and foreign providers. The objective is to create an integrated R&D centre, the KPC International Petroleum Research Centre, by 2023.

Outside the oil sector, the most R&D-intensive sector is the chemicals sector. In the services sector, health is the most innovative sector (75% innovate and 38% do R&D). In addition, there is a large number of patents in the medical sector. A group of medical doctor inventors has been mobilised to create a Centre for Medical Innovation. Examples of their inventions: a novel biodegradable balloon system used in kyphoplasty (spine surgery); arterial internal guide needle deployment and suturing device; an innovative arterial puncture and closing device; sinus venosus atrial septal defect percutaneous treatment device

enabling treatment by cardiac catheterisation without using surgical intervention. However, this initiative, led by NASCO, has not managed to rally support from the Ministry of Health.

Co-operation and business-academia linkages are very low

Co-operation in R&D and innovation is rare (only 14% of innovative companies engage in co-operation) and linkages with academia are very weak, since companies prefer working with suppliers, other enterprise group companies or clients.

During the interviews with companies, the OECD Review team heard that co-operation with Kuwaiti research organisations is difficult, due to lengthy processes of engagement, misalignment between research and the needs of companies, the bureaucratic approach of the KISR and KU, and the inability to move from theory to practice. In addition, there is a lack of incentives (the KISR, for example, gets its base budget reduced by the amount received from a private entity, thus cancelling any incentive to engage in projects). Similarly, secondment of researchers from academia to business is not possible under the institutional rules of KU and the KISR. Another issue was the lack of information sharing, which hampers the emergence of new ideas in interactions with the KISR, for example.

1.6.2. Financial support instruments for innovation, both direct and indirect

Innovation is subject to significant market failures, and market mechanisms supported by framework conditions alone usually result in underinvestment in innovation and levels of innovation achieved are below socially optimal levels.

This situation justifies government intervention to stimulate innovation in businesses. Direct financial support includes instruments such as direct grants, subsidies, loans or equity funding, and is usually used to support longer term and more radical forms of innovation. Indirect instruments include fiscal incentives such as tax credits, which mainly boost short-term applied research and incremental innovation (OECD, 2015b).

Direct funding provides the advantage of selection according to specific criteria, such as technical merit and feasibility, market prospects, contribution to the resolution of specific societal challenges, or other policy goals. The disadvantages are the relatively high resource requirements for its implementation (need for individual project review and approval) and the limited ability of government to “pick winners”. A way around this issue is in a “funnel” or “stage-gate” approach, whereby at an initial stage, a large number of projects are supported with minimal selection and successful projects within that sample are further supported by more substantial subsidies. Such a phased approach is applied, for example, in the US Small Business Innovation and Research Program and similar programmes in Japan, Korea, the Netherlands, Sweden, Chinese Taipei, the United Kingdom and, most recently, Australia and Canada.

Tax support for R&D is given as indirect support to R&D, according to the principle that R&D spending can be deducted from taxes in an enhanced way compared to other business expenses. Tax credits have the advantage of being relatively simple to administer (their processing is included within the usual tax processing). However, targeting is more complex and a certain amount of the support is lost to free riding (i.e. R&D spending that would take place regardless of the incentive benefits from windfall gains). It is worth noting that even in an environment with no corporate tax, a tax credit could work as a negative tax (i.e. a subsidy). In some countries, tax credits are given regardless of whether the company is making a profit or not (i.e. in some cases when the company is loss-making, a tax credit will result in a cash payment to the company).

There is very little direct or indirect financial support for innovation and R&D

The only targeted instruments for R&D are those provided by KFAS Innovation and Enterprise Directorate, which offers grants and exposure to international knowledge providers.[15] KFAS provides funding of the initial phases to identify the problem and the solution and finds the partners. In one example, KFAS brought Fraunhofer to Kuwait and co-financed initial stages of co-operation between a local food company and a local polypropylene producer to make wrapping which detects rotting of meat products. The programme is very limited for the moment and works with a pool of 20 companies and sponsors on an average of 15 projects per annum for a total budget of less than USD 1 million. This type of initiative should clearly be scaled up. In addition, it should be noted that, due to its statute, KFAS cannot finance the company itself, only the external partner.

There are no tax credits or other fiscal incentives for innovation. Some equipment can be exempted from customs upon authorisation by the Public Authority for Industry.

The National Fund for SMEs has a very large (USD 6.6 billion) endowment. However, the support it provides (presently in the form of loans) is targeted at start-up entrepreneurship, with no specific provision for innovation. Indeed, some of the rules of National Fund loans tend to discourage technology start-ups to apply, such as the rule that all equity must belong to Kuwaitis. Since some skills are difficult to find among nationals (for example software development skills), entrepreneurs need to source those skills from abroad and thus need to be able to offer equity to non-Kuwaitis, and this is impossible under National Fund rules. The National Fund also faced many operational issues, which resulted in a very low number of loans being disbursed in its initial years of operation. There have been successive reforms to try to improve its performance, and the private sector is now on the Board of the National Fund. Equity instruments for seed financing are also foreseen.

Additional support is available from a specific SME fund managed by the Industrial Bank of Kuwait. It provides Islamic finance for entrepreneurs exclusively for the purchase of physical assets (equipment). The Industrial Bank of Kuwait purchases the asset and leases it to the entrepreneur. However, staff costs and working capital cannot be financed from this source.

A small number of venture capital funds operate in Kuwait (Faith, Arzan, KFH Capital), but there are still some barriers for efficient operation of private equity, such as provisions for share splits, bonus shares or preference shares.

There is no legal framework for crowdfunding in Kuwait.

1.6.3. Intellectual property rights

The comparative advantage of a firm or country no longer depends on traditional inputs such as land, labour and physical capital. Firms in both developed and developing nations increasingly cite intellectual property as their main driver of growth. Intellectual property therefore needs to be protected, most often through patenting, but also through trademarks, industrial designs and as trade secrets.

There is growing evidence that intellectual property rights affect foreign direct investment decisions around the world. Committing adequate resources to the administration and enforcement of intellectual property rights can help attract foreign direct investment and promote innovation and technology diffusion (Primo Braga and Fink, 1998).

Kuwait has adopted some of the main international frameworks for intellectual property rights…

Kuwait is a member of the World Intellectual Property Organization (WIPO) and, as a member of the World Trade Organization (WTO), is also signatory of the WTO Agreement on Trade-related Aspects of

Intellectual Property Rights (TRIPS). Kuwait also adheres to the Arab Convention for the Protection of Authors Rights and the Berne Convention for Protection of Literary and Artistic Works.

According to the World Economic Forum's Global Competitiveness Index 2017-2018, Kuwait ranked 80th out of 137 countries in terms of intellectual property protection. Kuwait is a net importer of intellectual property.

Kuwait joined the WIPO Patent Cooperation Treaty (PCT) in 2016 and was the sixth and final Gulf Cooperation Council member state to accede to the PCT (WIPO, 2016). Any PCT application filed on or after 9 September 2016 will automatically include the designation of Kuwait. Kuwait is bound by the optional Chapter II of the PCT.

Kuwait took steps to strengthen its intellectual property laws by implementing the GCC-wide trademark law in December 2015. Trademark applications can be filed at the Kuwaiti Trademark Office, organised under the Ministry of Commerce and Industry.

…but needs to do more to protect intellectual property in the digital age as well as trade secrets

The next steps include accession to the WIPO Performances and Phonograms Treaty and the WIPO Copyright Treaty – the so-called WIPO Internet Treaties – that set up a comprehensive copyright and related rights management and enforcement model system for the digital age. In May 2016, Kuwait's National Assembly passed the new Copyright and Related Rights Law.[16] The new copyright statute contains provisions that regulate related rights and apply to performance artists, sound record producers and broadcasting organisations (STA, 2017). Thus, this law represents an improvement over previous legislation, as it will help Kuwait accede to the WIPO Performances and Phonograms Treaty.

Kuwait does not have a separate statute that regulates a trade secrets law exclusively. Hence, firms use robust and strong contractual provisions as a strategy for protecting trade secrets. However, this approach has shown its limitations and a strong trade secrets law could be instrumental in improving intellectual property protection and monetisation as a lot of intellectual property (especially process-related and business practice-related) is not typically protected through patents or copyrights.

With local patenting options being unstable, inventors prefer USPTO patents

Patent protection in Kuwait used to work exclusively via the GCC Patent Office. In April 2016, the Kuwaiti Ministry of Commerce and Industry started regulating patent protection in Kuwait via Law No. 115/2016, implementing the previously issued Patent Law (No. 71/2013)[17] to approve and implement the regional GCC Patent Law declared in 1999. Since then, the Kuwait Patent Office stopped accepting applications and instructed interested parties to seek protection through the GCC Patent Office in Riyadh, Saudi Arabia.[18] However, in 2017, Kuwait reinstituted the national intellectual property office for examining patents.

It is noteworthy that more than 90% of patents from Kuwait were filed with the USPTO and not locally. Practitioners attribute this mostly to prestige associated with USPTO filing. Another reason is the relatively small market in Kuwait, where it makes little business sense to obtain intellectual property protection.

A patent pipeline has been initiated, but the market value of these patents is questionable

The activity of technology transfer offices at both KU and KISR has thus far been focused on handling inventions claims from research staff, whereby those inventions were forwarded to a US attorney who drafted proper patent applications and filed them with the USPTO.[19] The Sabah Al-Ahmed Centre for Giftedness and Creativity (SAC) provided the same service for individual inventors.[20]

In addition, the government provides a KWD 1 000 cash payment to every inventor who is granted a patent through SAC. If the inventor works at Kuwait University, they are eligible for up to KWD 2 500, and up to KWD 7 000 for a group of inventors.

Such a policy resulted in a rapidly growing pipeline of patent applications, which reached a peak of 116 applications in 2013. Starting in 2014, support was only provided to selected inventions, and thus the number of applications stabilised at 80-85 per annum for 2014-16.

A seemingly respectable pipeline of patents has been thus generated (448 between 2010-17), spanning sectors such as medical technology (58 patents); transport (35); furniture and games (35); control (30); civil engineering (30); measurement (26); other consumer goods (25); chemical engineering (21); other special machines (20); and others.

However, out of this portfolio, only one has been commercialised to date. Several medical technology patents seem to have market potential and commercialisation options are being investigated by NASCO, a subsidiary of the National Technology Enterprises Company (NTEC).

1.6.4. Support to technology diffusion through start-ups, science-industry co-operation and place-based policies

Technology diffusion and its widespread adoption unlocks productivity gains and growth. Commercialisation of inventions from universities and research institutes, know-how transfer from global knowledge stock, as well as co-creation and co-invention, play an important role in greater knowledge generation and moving the technology frontier of the country along with greater use of technology for economically productive purposes.

This is why a sound innovation ecosystem must have entities (such as technology commercialisation offices)[21] or programmes (such as technology extension services),[22] as well as various facilitator organisations, such as technology incubators, science parks, competence technology centres that serve to foster knowledge generation, technology transfer and diffusion, in addition to steering research towards industry needs.

These institutions should provide not only easy-to-access and affordable infrastructure (typically office space and/or laboratory space), but also specific services, including consulting for business strategy, product development and intellectual property protection, among others. In addition, those accelerators should provide contacts and networking to facilitate access to finance and a range of professional services, including legal advice, accounting, recruitment and so forth.

Place-based policies include cluster policies. The definition of a cluster varies, but the general idea is that a firm can have its competitiveness enhanced if it is embedded in a cluster of competitive suppliers (which will provide high-value inputs at competitive prices), strong competitors (whose competitive pressure will encourage continuous improvement within individual firms), sophisticated clients (which will set expectations for high-value products) and responsive local government (which will create regulatory conditions for competitive operations). Cluster support policies can aim to create new industry clusters through co-ordinated action for R&D activities and service support for entrepreneurs. They can also be geared at internationalisation by opening access to international markets and knowledge flows; or they can support networking platforms to facilitate science-industry interaction such as in excellence centres and science parks (OECD, 2015b).

A start-up ecosystem is emerging, but critical mass is yet to be achieved

There is a fledgling start-up ecosystem in Kuwait. Role models are Talabat and Carriage, two online retail companies that have been quite successful. Their founders were able to exit their investments profitably through a sale to a foreign entity for amounts in excess of USD 100 million each. This triggered a (limited)

wave of technology[23] start-ups launched in 2017 and 2018 in a variety of business-to-consumer sectors, as well as a fintech and a healthcare technology platform – a number of these (less than ten) have been able to raise some funding.

A number of private sector incubator and accelerator programmes are active in Kuwait. They typically offer co-working space, events (including networking events, boot camps and workshops), as well as mentorship services (help with business development, product-market fit, development plans and others). However, the training and mentoring aspects are typically less developed than the real estate office space component.

One of the most advanced programmes for entrepreneurs is that of Zain Great Ideas with Brilliant Lab, focused on training entrepreneurs who want to launch technology start-ups, and the best applicants are offered an acceleration programme in San Francisco with "Mind the Bridge" and a visit to the Silicon Valley. Recently, several fablabs have been set up to facilitate prototyping, essentially by providing computer-aided design and 3D printing services to entrepreneurs.

However, entrepreneurs who start up in Kuwait often move out, typically to Dubai for market and regulation reasons, or to Egypt for reasons of costs and ease of hiring talented people.

In the interviews with entrepreneurs, the OECD Review team heard that financing of start-ups is an issue. While the entrepreneur is entitled to "workforce support" subsistence (if a Kuwaiti national), it is much lower than the alternative of a government job. Financing from the National Fund is not necessarily a good option, since it forbids giving any equity to non-Kuwaitis. In addition, selection criteria lack transparency. Other issues faced by entrepreneurs include high fees for point of sale payments.

The National Innovation Centre is a new initiative that has been announced by the Amir in order to "*create an ideal environment for innovation and attracting Kuwaiti intellectuals, inventors, and innovators and entrepreneurs whose ideas contribute to supporting the Kuwaiti economy.*"[24] The scope and activities of this centre remain to be defined.

Efforts at technology transfer have had limited success in Kuwait

A number of initiatives have been set up to bridge the gap between research and commercialisation. They include technology transfer offices (TTOs) at KU and KISR, the NTEC[25] and the SAC.[26]

TTOs' activity at both KU and KISR has thus far been focused on handling inventions claims from research staff, and the SAC has been offering the same service to individual inventors.

The commercialisation function of the TTOs has not yet commenced, due to a lack of human and financial resources. Namely, the status of TTO staff is that of support staff, which is much less attractive than the status of academics. Therefore, it is impossible to attract the talent that is needed for the successful operation of a TTO: people who have experience in both business and academia and are thus able to bridge the gap between both worlds.[27]

The NTEC was originally set up as a subsidiary of the KIA with the objective of investing in foreign technology firms and creating spill-overs in Kuwait. Through scouting local and regional markets, the NTEC identifies market needs and potential business opportunities in both private and government sectors, then reacts via its various business models and the capabilities of its fully owned subsidiaries, to address such needs and opportunities in a manner that suffices its main objective to absorb technology into the Kuwaiti ecosystem.

There have been several attempts to achieve such technology transfer from foreign countries, in some cases acting in partnership with KISR. However, mostly what has been achieved is portfolio investment in foreign companies interested in doing business in Kuwait, without any significant technology spill-over.[28]

The NTEC faces problems to fulfil its mission, such as public procurement based on lowest price in tenders, giving little incentive for innovative technologies. Control by government regulators sometimes interferes with business decisions, such as asking for a tender to local companies instead of investing in a company with the right technology directly, exiting an investment at a certain point in time, etc. Financial audit has a very strong influence, emphasising financial results rather than technology transfer. Secondment of academics from KU to the NTEC is also not possible.

More recently, the NASCO subsidiary of the NTEC has started searching for promising local technologies. It has identified a niche of excellence in medical technology where a small group of 10 doctors have 20 patents with market potential. NASCO is facilitating a network that should lead to commercialisation of these inventions.

More broadly, academia-industry collaboration would be welcomed by companies, for example secondment of KISR's or KU's scientists to private companies. Today, this is not an option and academics need to take considerable personal risk if they want to switch to a business (be it a state-owned enterprise or in the private sector). In some sectors such as pharmaceuticals, there is no domestic academic base, so international linkages would be desirable. KFAS' Innovation ad Enterprise Directorate is helping some companies in this endeavour, but awareness about this programme is still low.

Clusters

The only significant industry clusters in Kuwait concern the oil sector and the energy and water utilities. In these clusters, there is a certain degree of co-operation between academia and industry, centred on specific research centres organised within KISR to provide academic research input. However, co-operation between the companies and KISR has scope for improvement.

1.6.5. New industrial policy and mission-oriented policy

Rather than focusing on state aid and creating national champions, new industrial policy focuses on facilitating co-ordination between economic agents, especially in strategic, future-oriented sectors (avoiding as much as possible defensive action for historic sectors). It also tends to focus on technologies, and increasingly on well-defined challenges or "missions", rather than industrial sectors. Typically, the technologies that can be encouraged are those known under the name of "Industry 4.0", including digital technologies (artificial intelligence, blockchain, quantum computing and 3D printing); biotechnology, nanotechnology and converging technologies; and others.

Industrial policy and mission-oriented policy do not seem to be available

The past decade has witnessed a new rise of voluntarist industrial policies based on targeted and challenge-oriented public interventions in several OECD countries and beyond, in particular to tackle mounting societal challenges and/or to support competitiveness in priority areas.

Kuwait's industrial policy strategy was not communicated to the OECD Review team. According to interviews, priority seems to be given to large infrastructure projects, such as industrial cities to be created in the north and centre of Kuwait, as well as the development of Kuwait's islands. Priority is being given to the logistics and financial sectors, aligned with Vision 2035. Trade flows are foreseen to exploit the geographical position of Kuwait as a politically stable country providing a gateway to Iraq and the Islamic Republic of Iran. However, the OECD Review team has not been shown any evidence (such as market studies) as to the market demand for such intermediation – after all, both Iran and Iraq have their own access to the Gulf and it does not appear evident that they would need to transit through Kuwait.

The Kuwait Authority for Partnership Projects (KAPP) was established in 2008 and serves as the main body responsible for public-private partnership project implementation. KAPP has carried out 67 tenders

since 2013 and 2 projects have been completed and signed, notably the Shagaya Renewable Energy Park phase III for a combined project with photovoltaic, concentrated solar power and wind power plants of 2 000 MW total installed power and AZ-Zour North desalination plant. Nevertheless, there is a lack of a strategic vision for leveraging public-private partnerships in Kuwait and projects have been stopped, sometimes in very advanced phases.

An industrial park is being created in Shadadiya to provide SMEs with plots equipped with basic infrastructure and utilities. Such a project will ease the current difficulty of securing industrial land.

At the moment of writing, there seems to be no initiative preparing Kuwait for the Fourth Industrial Revolution, contrary to neighbouring countries. Interviewees noted that introduction of fibre is delayed in Kuwait by about ten years compared to neighbouring countries and Internet cross-connection fees (set by the ministry) are much higher than in neighbouring countries. At the same time, Qatar has a country-wide strategy for 5G introduction and the United Arab Emirates has multiple initiatives, such as Media City for the creative sector; Masdar, which aims to become the first carbon-neutral city; and the Blockchain Dubai initiative, which aims to base the city governance on the blockchain concept.

Additionally, and as previously mentioned, Kuwait has a tradition of bottom-up initiatives (at different levels: to develop the SCPD's national plans as well as higher education and research institutions' strategies) and few tools for mission-oriented research and innovation (the DDI in diabetes research and innovation; some KFAS flagship projects; KISR's R&D centres for the private sector to be created by 2021).

1.6.6. Demand-side policy and grand challenges

Public procurement exceeds 10% of GDP in most OECD countries (in the European Union it averages 14% of GDP). This huge purchasing power offers an opportunity to foster innovation directly. A large government contract has the potential to provide sufficient financial returns to warrant significant investment in innovation from the bidding companies. This applies to a range of procurement items, starting from the very basic ones such as buildings, where functional requirements rather than fully technical specifications can foster innovation. In one example from Finland, a tender requests to provide a solution for locking the schools (rather than a tender for locks), inviting innovative solutions such as digital locks. It also applies to more advanced tenders to address societal challenges – one example is the search for commercial-scale low-carbon emissions mobility solutions.

Demand-side policy and grand challenges do not seem to be a priority

The only initiative that has been identified which is related to public procurement for the grand challenges is linked to renewable energies, such as the Shagaya project demonstrator with wind and solar energy production. This is consistent with the Amir's vision of achieving 15% renewable energy in Kuwait by 2030.

During interviews, several research actors involved in strategic projects with public authorities pointed at the lack of awareness of and capabilities for innovation in public administrations, which prevent them from fully playing their role on the demand side (through research contracts, innovative procurements, etc.).

1.7. Recommendations

Going forward, Kuwait requires a clear strategy of promoting science, technology and innovation as a major enabler of the transition towards the knowledge economy and society, in order to warrant inclusiveness and well-being for all citizens and residents in the post-oil era. Such a strategy should be articulated around the following pillars: 1) raising awareness of and reducing the barriers to innovation; 2) setting up the appropriate governance mechanisms; 3) reinforcing the scientific research base; 4) developing support for business innovation; 5) fostering knowledge transfer and technology diffusion;

6) building up human capital; and 7) enhancing the role of STI in support of societal challenges. An overview of the recommendations is provided in Figure 1.1.

Raise awareness and reduce barriers to innovation. In particular:

- **a** Raise **awareness and promote science, innovation and entrepreneurship as national values.** Motivation for entrepreneurship and innovation in the Kuwaiti context will mostly come from the quest for esteem and self-realisation, rather than the need to ensure a livelihood. Therefore, it must be made clear that innovators and entrepreneurs will acquire social recognition and status. The Amir's initiative to create a national innovation centre is a case in point. An initiative from the top leadership is a signal to all stakeholders that "innovation is good", a key component of Kuwait's desired development path, and will be valued in society up to the top leadership. This initiative has to be followed up with consistent actions at all levels of government, which is the only way to build credibility and momentum for change. Such actions could include innovation and science competitions, prizes ("Entrepreneur of the year", "Innovator of the year", popularisation seminars for youth, etc.). In addition, initiatives in favour of citizen science can be encouraged, where members of the general public can contribute to scientific projects.
- **b** **Continue improving framework conditions.** Kuwait has been improving its overall business climate in recent years through dedicated reforms. Those efforts should be pursued, and more specifically in areas which are seen as most problematic for doing business, in particular: inefficient government bureaucracy, restrictive labour regulations, corruption and work ethic in the national labour force. Reforms in company laws that specifically are relevant to start-ups and venture investors should also be considered, particularly pertaining to stock splits and similar equity operations, as well as insolvency and bankruptcy laws.
- **c** **Unleash the innovative spirit of non-Kuwaitis by providing equal opportunity.** Advanced countries across the globe have leveraged the energy, scientific potential and entrepreneurial spirit of immigrants, by giving them equal opportunity, and in some cases openly attracting them. Non-Kuwaitis represent about three-quarters of the resident population, and many of them are second- or third-generation residents, and yet do not have the same rights and opportunities as Kuwaitis. This applies to education, employment and entrepreneurship opportunities. The best educational options should be open indiscriminately to Kuwaitis and non-Kuwaitis alike. Tenure in academic institutions should also be achievable for non-Kuwaitis and entrepreneurship rules should put non-Kuwaitis on equal footing with Kuwaitis. A non-Kuwaiti entrepreneur should be given the possibility to start a company without a Kuwaiti sponsor, and to access financial support on equal terms with Kuwaitis (e.g. from the National Fund).
- **d** **Further involve Kuwait in regional and international co-operation.** Kuwaiti researchers are involved in scientific co-operation with international partners, but such co-operation is not sufficiently institutionalised. The Blue Ribbon report called for KISR to establish its centres as regional centres of excellence, but this regional dimension hasn't materialised. Options should be explored for enhanced regional co-operation in areas of expertise such as water, petroleum, environment, agriculture and others. Kuwait could consider participation in regional science and technology initiatives such as the SESAME facility in Jordan.

Set up the appropriate governance and institutions for the STI system to integrate the different pillars of the system by: setting strategic orientations to guide the different communities of public and private actors towards common goals; co--ordinating the different interventions across the key government bodies (notably ministries and agencies in relevant policy areas); ensuring the investment of commensurate national resources and establishing a clear division of labour between the leaders of each line of intervention (including by creating new institutions when needed); collective monitoring of progress accomplished towards the common goals.

a **Develop an integrated national science, technology and innovation strategy coherent with the "New Kuwait" vision for attaining "Smart Kuwait" in 2035**. A collaborative process involving representatives of academia, business, civil society and government should be established to set a roadmap for the Kuwaiti STI system. In order to avoid the problems encountered by the Kuwait Science, Technology and Innovation Council (KSTIC), proposed as soon as 2007 but never created, these representatives could be gathered in a temporary high-level strategy group with the specific mandate of developing the strategy. To guarantee the strong legitimacy and leadership of this group despite its time-bound nature, its mandate should emanate from the highest-level of policy making, i.e. His Highness the Amir. Following international good practices, the strategy should have a long-term horizon (e.g. ten years) with a revision taking place after five years to align it with the SCPD's mid-term development plans. Specific objectives should be set for STI to facilitate the "New Kuwait" vision of transforming the country into a knowledge-based society – "Smart Kuwait", which should shift focus from resource exploitation to knowledge exploitation.

b **Create a wide-scoping ministry with an overall mandate for science, technology and innovation policy** as the major enabler of the transition towards "Smart Kuwait". This ministry will be responsible for devising and implementing specific policies for STI to implement the integrated national innovation strategy, in co-ordination with other ministries and spanning the full innovation cycle from laboratory to the marketplace. The number of ministers being limited by the Kuwait constitution, a solution needs to be found in the framework of the restructuring of the Government of Kuwait, but a strong STI ministry will be the essential enabler of the transition to "Smart Kuwait". This Ministry should have an initial task of drafting a multiannual action plan in close contact with a network of innovation "focal points" or "champions" in each implementing body (other ministries and agencies). Under the leadership of the STI ministry, these could meet regularly on an informal basis to co-ordinate their actions, monitor progress against clear input and output (need-based) objectives and review challenges in implementing the national innovation strategy. The creation of such interministerial network could be a first effective step to identify the relevant competencies across the government and raise awareness on the importance of the dedicated policy actions to realise the integrated national STI strategy. The action plan should include the establishment of specific financing instruments for the various segments of the STI system (higher education, public research organisations and businesses).

c **Create a fully professional research and innovation agency**. An autonomous and fully professional agency should be in charge of the management of the funding instruments and other initiatives that aim to support research and innovation activities in public and private organisations which execute the research. This agency would be responsible for tendering competitive research grants based on scientific merit, grants for business R&D and business-academia co-operation based on innovativeness, market potential and other criteria, and various initiatives to support entrepreneurship (in particular research-based start-ups, as well as innovative service and manufacturing ventures). The agency would also dedicate direct funding to larger strategic projects according to priority objectives within a defined timeframe. Such an agency needs to remain at arm's length from the government to remain flexible and be fully autonomous from the policy-making level in operational matters in order to avoid any conflict of interest. It should report to its line ministry (i.e. the STI Ministry proposed above) with regards to its performance and realisation of its objectives. Creating this agency as a body subject to government rules would hinder its agility and effectiveness, which are key conditions for its success. Several international examples exist of organisations performing agency functions with specific status that guarantee their financial and operational autonomy (including for instance non-profit organisations with public service delegation; public organisation with special regime, etc.). Moreover, this agency should have a budget commensurate with its mandate and managed through sound 'principal-agent' governance rules to ensure the best use of these resources (i.e. setting of clear objectives, independence in

the realisation of the objectives, performance contracts for monitoring and funding). Its role should be clearly set out in its mandate in order to ensure that it is not redundant with existing entities, including performing institutions such as KISR and KU, but also KFAS. Currently, KFAS performs several of these agency functions, as a private non-profit organisation and without public resources. A new agency would therefore inevitably overlap with KFAS if the two entities are not properly coordinated. Moreover, KFAS has already accumulated significant competences which should be leveraged for supporting the creation of the agency. Two possible options are: i) transferring some of KFAS staff in the new agency and focusing KFAS on its other activities (capacity-building, awareness raising, service to companies, research centres, etc.); ii) delegating the agency functions to KFAS (with proper public funding and governance rules proposed above). Examples of delegation of public service to private or semi-private organisations exist and could be used as examples to scan the different possible options.

d **Improve the production of STI-related statistics to enable the development of evidence-based policies**. STI-related statistics do not exist in Kuwait. An initial innovation and R&D survey was organised in 2018 and 2019 for the purpose of this Review, and such surveys should continue and adhere to international standards. Similarly, the monitoring of budgets and scientific outputs at higher education institutions and public research organisations need to be significantly stepped up. The basis of STI-related statistics should allow an effective monitoring of the national innovation strategy. A dedicated unit could be established as an STI observatory with the mandate to follow STI-related indicators nationally and benchmark them internationally. This would allow reducing overreliance on international indicators.

Reinforce the scientific research base to ensure absorption of knowledge from international sources, as well as endogenous production of knowledge in niches of excellence. In particular:

a **Gradually increase funding for R&D in public and private institutions.** Overall spending on R&D is estimated at 0.33-0.37%[29] of GDP, less than a fifth of the 2% target set in the Blue Ribbon report 12 years ago, and only half of the spending realised in neighbouring UAE and Saudi Arabia. A roadmap would need to be established to ensure that the increased funding is spent on results-oriented research and development endeavours. Eligible themes would need to be defined in the national STI strategy, including projects which can help resolve societal challenges and the development of knowledge-intensive products and services in the Kuwaiti economy and the overall contribution to Kuwait's national development plan. A gradual increase can be achieved pending appropriate governance arrangements proposed in other recommendations. In particular, competitive research grants could ensure that only the best projects are financed, and performance-based contracts with institutions could guarantee that funding is linked to performance as measured by key performance indicators. In line with Kuwait's aspiration for a knowledge-based development path and practices of other resource-rich countries (Kazakhstan, Norway), a mechanism could be set to dedicate some of the resources from oil directly to a central "knowledge fund" dedicated to finance public and private HEIs and research institutions' research performance contracts, as well as other channels supporting research and innovation.

b **Introduce performance contracts for higher education and public research institutions.** The current budgeting principles for funding higher education and research institutions should be replaced by a simple multiannual performance contract containing a modest performance-based component (for instance 5-10% of the institutional funding by the government) including both higher education and research activities. The rest of the funding could be based on historical data and various input parameters (number of staff, number of students, etc.) and be allocated as a block and not per item lines as is currently the case. These performance contracts should be developed by the institutions based on their internal strategies and reviewed and negotiated with the STI Ministry mentioned above.

c **Remove the disincentives to external funding in HEIs and research institutions.** The funds raised by these institutions should not be subtracted from the institutional funding allocated to these institutions, as is currently the case.

d **Remove the bureaucratic barriers and streamline the basic processes involved in research activities in HEIs and research institutions.** A thorough review of the rules and practices (including those related to the Kuwaitisation policy) involved notably in recruitment, the purchase of equipment, research contract management and research proposal selection should be undertaken so as to remove excessive red tape leading to delays and diversion of efforts. If necessary a change of legal status of HEIs and research institutions should be envisaged to increase their operational autonomy, allowing them for instance to appoint academic and other staff using private law contracts, and purchasing equipment with greater flexibility.

e **Revise the incentive system in public universities to increase the engagement of faculty in research activities.** Public universities should review their respective career system, including the criteria for promotion to associate professor and full professor status, in order to assess whether they value sufficiently faculty research performance and provide incentives all along the career path. The promotion scale should also ensure recognition of high performance of full professors, including in terms of publications, patents, data and software publications, as well as collaboration with industry. Institutional incentives also could be developed by using an internal, performance-based funding system, where the research performance of an operating unit feeds back to the financial resources of this unit, providing opportunities and scientific esteem for its staff.

Develop support for business innovation in order to overcome the market failures of innovation, which include the high risk involved, the long-term horizon and the public good nature of innovation, which creates positive externalities not easily captured by the investing entity. Such support needs to be targeted both at the start-up/entrepreneurship phase as well as at the high growth phase of established companies, and address technological and non-technological innovation, as well as services innovation.

a **Help businesses to engage in R&D through dedicated support schemes.** Companies often see R&D as a high-cost and high-risk activity, with uncertain benefits. Such a market failure justifies governmental measures which seek to lower the cost and therefore improve the perceived cost-benefit profile of R&D. Therefore, simple innovation grants whereby 50% or more of a company's R&D project could be financed by a professionalised agency that is able to assess and to some extent advise the firms; the Austrian FFG (industrial Research Promotion Agency) basic programme or the German Central Innovation Programme for SMEs (ZIM) are examples. Additional grants could concern non-technological innovation and services innovation. Kuwait should consider the introduction of R&D tax credit (in Kuwait where most companies are not subject to corporate tax, this would amount to a negative tax, or subsidy, equivalent to a certain percentage of incurred eligible R&D costs).

b **Create a holistic support mechanism for start-up companies.** Currently, the National Fund for SMEs provides mostly loans to start-up companies. However, some of the rules are too rigid for technology start-ups (such as the rule about 100% Kuwaiti-owned equity). In addition, start-up financing calls for equity financing, and therefore such instruments should be provided. In parallel, incubation and acceleration schemes should be set up to support entrepreneurs in setting up and developing their businesses and make them ready for investment. In addition, linkages to public research institutes should be encouraged for knowledge-intensive start-ups (see also recommendation 5.b).

c **Use public procurement to encourage innovation**. Existing procurement can be adapted to encourage innovative solutions by using functional requirements rather than technical specifications, as they can spur innovative solutions. Going forward, the solution to key societal challenges can be tendered out to encourage innovative solutions, rather than purchasing off-the-shelf technologies.

d **Support the upgrade of innovation capabilities in state-owned enterprises**. Introduce metrics of innovation in the governance of state-owned enterprises and require them to analyse and pursue trajectories in their industry. In Kuwait, this would mean enhancing the transition of industry from petroleum to petrochemicals, as well as considering spin-off technologies, such as the development of digital services currently provided in-house as a product offering (e.g. digital modelling of oil reservoirs, solar technologies used internally, etc.).

Foster knowledge and technology diffusion and co-creation between science and industry as equal partners, which can occur in three different aspects of "push", "pull" or co-creation: 1) commercialisation of scientific discovery ("push"), both endogenous and imported through knowledge transfer and licencing; 2) contract research on demand from industry ("pull"); and 3) co-creation of knowledge in specific competence technology centres where projects are jointly decided based on both technological and market considerations.

a **Initiate support for technology diffusion and absorption policies.** Technology extension services could be offered to facilitate technology absorption with SMEs. This could be done in co-operation with international development banks or international networks, such as those supported by Fraunhofer and Steinbeis.

b **Develop a** structured approach to creating links between business and academia. Strong barriers remain between the business and academic communities. In particular, consider: introducing the "third mission" of co-operation with industry in higher education institutions; introduce private sector representation on the governance boards of KISR; organise events to create opportunities for business and academia to meet; reinforce innovation vouchers to initiate small-scale collaboration (building on KFAS' "innovation research vouchers"); expand the collaborative grants for more mature projects (building on KFAS grant programmes); and create frameworks for effective spin-offs from KU and KISR.

c **Provide incentives for individual researchers to unleash their creative potential**. Researchers are not evaluated on their co-operation with business, and there are no schemes to promote mobility between the public and private sectors, such as an industrial Master's or PhDs, entrepreneurial leave of absence for government employees who wish to start an entrepreneurial venture (with a guaranteed return to their original employment in case of failure), as well as subsidies for employment transfer.

d **Establish mechanisms for technology foresight and intelligence**. While certain projects in firms employ product roadmapping, there is scant understanding of technology roadmapping. A dedicated mechanism that conducts technology roadmapping especially in areas such as petroleum, which is a key driver of economy, and future technologies that underpin the Fourth Industrial Revolution, may help stakeholders better appreciate the rapid advances of technology and its concomitant opportunities/challenges.

Build up the human capital needed for the transition towards a knowledge-based economy, in particular:

a **Create a new public research university with a strong focus on STEM disciplines.** Such a university should help build up STEM skills needed in the digital economy, thereby preparing the future generation for employment within the Fourth industrial revolution. Building on the new law approved in June 2019, that calls for the establishment of one or several new government national universities, and consistent with the Kuwait National Development Plan policy, a new university should come with new, more progressive rules to attract top faculty members worldwide. It should be a full research university, with significant funding for research based on performance institutional funding and competitive grants. While some degree of competitive overlap might be beneficial in some disciplines related to key sectors of the Kuwaiti economy, it will be important that the new university develop a strategic profile that is distinct from existing organisations, in

particular KU, PAEET and, for applied research, KISR. International scientific collaboration should be strongly encouraged. Significant efforts (including regional and international benchmarking) should be dedicated to create this new entity under a legal status that protects it from the excessive bureaucratic rules and regulations, as well as the inadequate modes of funding that hinder the existing higher education and research institutions. Several university systems provide useful examples of status created to enhance the institutional autonomy of universities and reduce the bureaucratic burden – for instance the "Foundations" in Portugal.

b **Provide support for the establishment of strong doctoral schools** involving world-class faculty, creating conditions for young Kuwaiti researchers to stay in Kuwait for this ultimate formal training step, while contributing to the scientific "footwork" necessary to fuel basic and applied research within the country.

c **Improve absorptive capacity for innovation by supporting upgrades in vocational education and training**. Lack of specialised training is brought forward as one of the weaknesses in the World Economic Forum's Global Competitiveness Report. A comprehensive evaluation of vocational training available at the PAAET and private universities would shed more light on reforms needed to bring vocational training to a satisfactory level. In order to create a market for specialised training, specific training vouchers could be considered, whereby government co-finances professional training for specific skills. Entrepreneurial learning could be introduced in upper secondary and tertiary education curricula. Introduce students at various levels, including intermediate and secondary levels, to essential concepts regarding innovation, emphasising ethical issues alongside related business practices.

d **Provide for career mobility between science and industry**, such as industrial Master's and PhD programmes, as well as secondment schemes between academic and industrial careers, and entrepreneurial leave of absence, to enable researchers to envisage an entrepreneurial venture with an option to return to secure academic employment.

e **Attract and support internationally recognised researchers**, by setting the appropriate conditions and incentives. This would include revising the strategy and rules of HEIs and research institutions with regards to the recruitment and employment conditions of expatriate staff to allow them to fully exploit the potential of non-Kuwaitis to enhance their research excellence and innovation performance. Foreign researchers should be able build their career (including the possibility to reach leadership positions) in Kuwait higher education and/or research institutions in order to strengthen the local research base on a sustainable and long-term basis. For instance, a non-Kuwaiti scientist should be able to have tenure at KISR or a state university. Inspired by good international practices (for instance Luxemburg), Kuwait could also set up a specific scheme for attracting a few high-level researchers in priority areas and supporting the development of their research teams. These internationally recognised researchers would be selected not only based on their track record, but also on the basis of a clearly defined project in line with Kuwait's national development strategy. For this to be possible, Kuwait could explore ways to exempt research and academic institutions from Kuwaitisation rules, including by providing citizenship to qualified individuals and talents.

f **Institutionalise nationwide forward planning of employment and skills**. The planning authorities should provide guidance to higher education institutions as to what skills and competencies will be most needed in the future and give them the possibility to regulate according to the flows of students among the different disciplines and specialties.

Establish the role of science, technology and innovation in resolving societal challenges.

a **Articulate the national innovation strategy around key economic and societal priorities.** Some ongoing initiatives address well-identified societal challenges, such as strategic "flagship" initiatives in the domain of renewable energies, the role of KISR's Water Research Centre, and

that of the Dasman Diabetes Institute for the societal challenge of metabolic syndrome diseases. Structuring these initiatives around "grand challenges", notably in the national innovation strategy, would allow a better targeting of these initiatives and would help build consensus around some key societal priorities to which research and innovation could significantly contribute.

b **Launch a few large challenge-based programmes under the MRDPs to tackle societal challenges in line with national priorities**. Since the national research and innovation system is not yet well developed and its research and innovation policy still to be formulated, it would be premature for Kuwait to develop an ambitious mission-oriented innovation policy (such as, for instance, the New German High-Tech Strategy and its 12 missions, or the mission-driven Top Sector policy and its 25 missions). A more realistic option would consist in setting a few large challenge-based programmes under the MRDPs to tackle societal challenges in line with national priorities, for instance in the water and energy areas. These programmes would aim to achieve concrete objectives in a defined timeframe, gathering all of the relevant research and innovation actors and using various instruments to cover the different stages of the innovation cycle, from applied research to demonstration and commercialisation. Beside their expected results, these programmes would also serve as a "test bed" for some of the new practices recommended in this Review: use of demand-side instruments (including innovative public procurement and regulatory reforms), additional strategic and performance-based funding for participating Kuwaiti institutions, increased openness to international scientists and innovation experts. Drawing on the best international examples, these programmes could also be used as a regulatory sandbox where the bureaucratic rules applying to research and innovation would be reduced. When enough experience has been accumulated, the lessons learnt during the implementation of these programmes could then be applied to the broader system.

Of course, all of these pillars are interlinked, and the success of transforming Kuwait into a knowledge-based society will critically depend on the balance of the policy mix achieved.

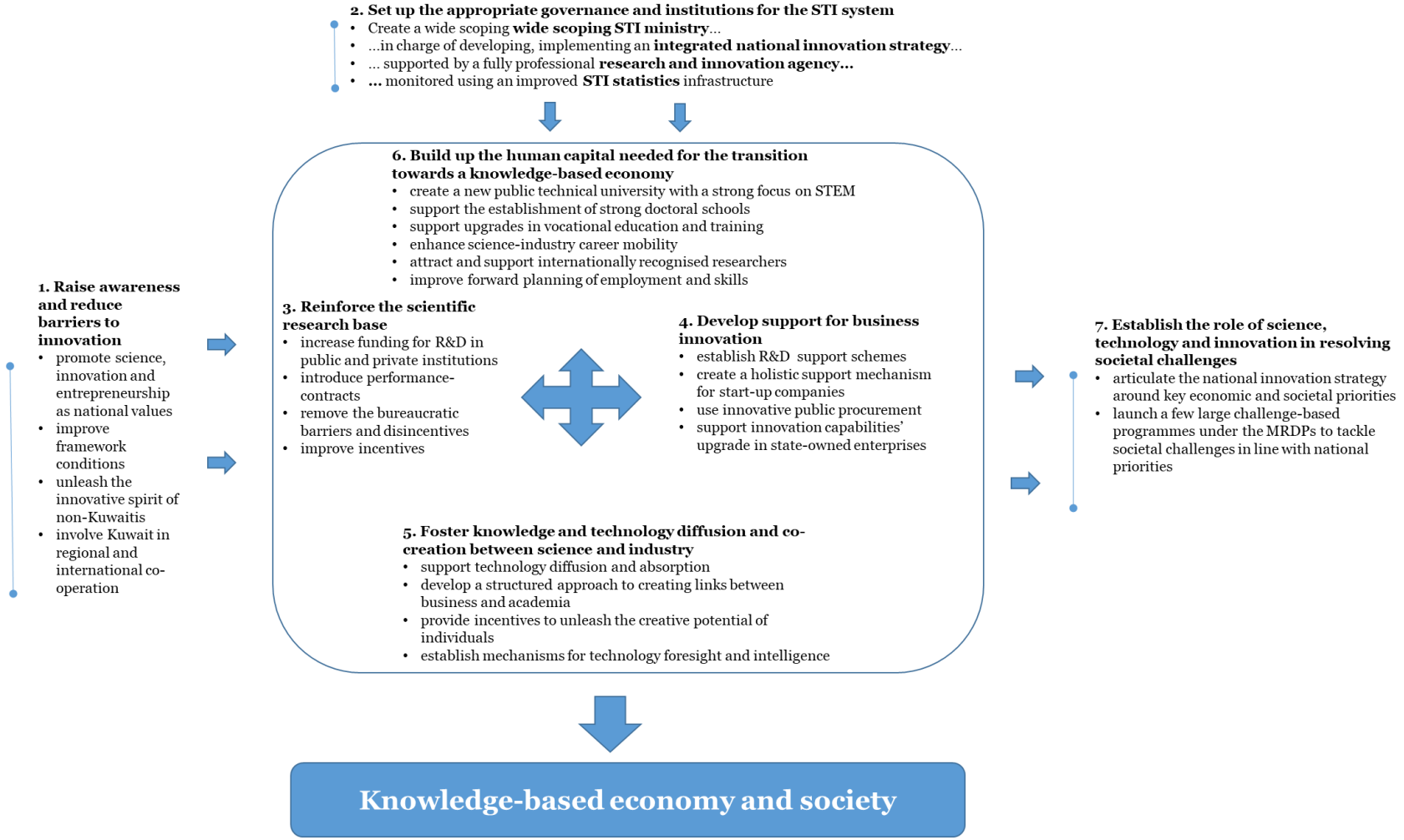
The sequence of implementation of these pillars depends on the potential of achieving a national consensus, which will create momentum for these ambitious reforms. It should be decided in a broad consultation process with the main stakeholders in the country.

Basically, two types of approaches could be envisaged:

1. A governance-driven approach where the first step would be the establishment of the top-level governance body which would need to develop a national strategy based on the findings of this Review, and a comprehensive stakeholder consultation. This strategy would then need to be implemented with an adequate governance set-up. Unfortunately, the likelihood of success seems quite limited, given the status of the discussions since the recommendation of the Blue Ribbon report in 2007 and the subsequent failure to establish an adequate governance set-up.
2. A pragmatic approach based on the establishment of the national innovation centre which has been initiated from the Amiri Diwan and can be seen as a new positive dynamic for Kuwait's national innovation system, in a demand-driven approach. A number of initiatives relative to the stimulation of business innovation and entrepreneurship from Pillar 4 could be implemented, accompanied by measures of linkages with academia (Pillar 5), by involving KU and KISR in the work of the centre. Initial successes ("quick wins") should create a positive sentiment toward STI, and thus facilitate the establishment of an adequate governance set-up, as well as the creation of a general climate favourable to the drafting of a national STI strategy. In parallel, significant efforts should be devoted in the short to mid-term to improving the incentives and removing bureaucratic rules that significantly hinder the research and innovation organisations already in place (Pillar 3).

Figure 1.1 provides a bird-eye's view of the main recommendations and shows the interactions between them, all of them contributing together to the achievement of the knowledge-based economy and society.

Figure 1.1. Mapping of the main recommendations



References

Al-Mahmood, A. (2017), *Kuwait National Development Plan and Economic Policies*, General Secretariat of the Supreme Council for Planning and Development, Kuwait Public Policy Centre and United Nations Development Programme, state of Kuwait.

Al-Mutairi, A., K. Naser and M. Al-Enezi (2017), "Job satisfaction among academicians at business colleges operating in Kuwait", *Asian Social Science*, Vol. 13/12, p. 9, http://dx.doi.org/10.5539/ass.v13n12p9.

Arman, H. (2017), "The influence of the strategic planning approach on the research agenda of RD organizations", in F. Calisir and H. Camgoz Akdag (ed.), *Industrial Engineering in the Industry 4.0 Era*, Springer.

Arnold, E. et al. (2017), *Review of the Research Excellence Framework: Evidence Report*, Department of Business, Energy and Industrial Strategy.

Berkeley Research Group (2017), *Cluster of Innovation Framework Study: Kuwait*.

Borowiecki, M. et C. Paunov (2018), "How is research policy across the OECD organised?: Insights from a new policy database", *OECD Science, Technology and Industry Policy Papers*, No. 55, OECD Publishing, Paris, https://doi.org/10.1787/235c9806-en.

CWTS Leiden University (2015), Bibliometric Evaluation for the Kuwait Foundation for the Advancement of Science 2002-2013/14.

Edquist, C. et al. (2015), *Public Procurement for Innovation*, Edward Elgar Publishing.

Franzoni, C., G. Scellato and P. Stephan (2011), "Changing the incentives to publish", Science Policy, Vol. 333/6043, pp. 702-703, http://dx.doi.org/10.1126/science.1197286.

IMF (2018), "Kuwait: Selected issues", IMF Country Report No. 18/22, International Monetary Fund, Washington, DC, https://www.imf.org/en/Publications/CR/Issues/2018/01/29/Kuwait-Selected-Issues-45593.

IMF (2020), "The Future of Oil and Fiscal Sustainability in the GCC Region", Departmental Paper No.20/01, International Monetary Fund, Washington, DC, https://www.imf.org/en/Publications/Departmental-Papers-Policy-Papers/Issues/2020/01/31/The-Future-of-Oil-and-Fiscal-Sustainability-in-the-GCC-Region-48934 KCSB (2015), Labour Force Survey, Kuwait Central Statistical Bureau.

KCSB (2011), Census, Kuwait Central Statistical Bureau.

Mahdi, K. (n.d.), New Kuwait 2035 Kuwait National Development Plan, Secretary-General of the Supreme Council for Planning and Development.

Mahdy Al-Jazzaf, A. (2007), Report of the Kuwait Research Review Panel.

Mohammed Bin Rashid Al Maktoum Foundation and Price Waterhouse Coopers (2008), Arab Human Capital Challenge: The Voice of CEOs, Mohammed bin Rashid Al Maktoum Foundation and PriceWaterhouseCoopers, Dubai, https://www.pwc.com/m1/en/publications/abir/ahccenglishfeb172009.pdf (accessed on 7 November 2019).

OECD (2017), OECD Reviews of Innovation Policy: Norway 2017, OECD Reviews of Innovation Policy, OECD Publishing, Paris, https://doi.org/10.1787/9789264277960-en.

OECD (2016), OECD Reviews of Innovation Policy: Malaysia 2016, OECD Reviews of Innovation Policy, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264255340-en.

OECD (2015a), Frascati Manual 2015: Guidelines for Collecting Innovation Activities, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris, https://doi.org/10.1787/9789264239012-en.

OECD (2015b), The Innovation Imperative: Contributing to Productivity, Growth and Well-Being, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264239814-en.

OECD/Eurostat (2019), Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation, 4th Edition, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris/Eurostat, Luxembourg, https://dx.doi.org/10.1787/9789264304604-en.

Powell, W. and K. Snellman (2004), "The knowledge economy", Annual Review of Sociology, Vol. 30, pp. 199-220, https://www.annualreviews.org/doi/abs/10.1146/annurev.soc.29.010202.100037.

Primo Braga, C. and C. Fink (1998), "The relationship between intellectual property rights and foreign direct investment", Duke Journal of Comparative & International Law, Vol. 9/1, pp. 163-187, https://scholarship.law.duke.edu/djcil/vol9/iss1/6.

Schwab, K. (ed.) (2019), The Global Competitiveness Report 2019, World Economic Forum, Geneva, www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf.

Schwab, K. (ed.) (2018), The Global Competitiveness Report 2017-2018, World Economic Forum, Geneva, https://www.weforum.org/reports/the-global-competitiveness-report-2017-2018 (accessed on 12 November 2019).

STA (2017), Kuwait: New Copyright Laws in Kuwait, Mondaq, www.mondaq.com/x/637952/Copyright/New+Copyright+Laws+In+Kuwait (accessed on 2 December 2019).

Times Higher Education (2019), World University Rankings, Times Higher Education, https://www.timeshighereducation.com/world-university-rankings (accessed on 8 April 2019).

UNDP (2018), "The Institutional and Technical Support for the Establishment of Kuwait Public Policy Centre (KPPC) Project", United Nations Development Programme.

WIPO (2016), "New PCT contracting state", PCT Newsletter, No. 06/2016, June, World Intellectual Properties Organization, https://www.wipo.int/edocs/pctndocs/en/2016/pct_news_2016_6.pdf (accessed on 2 December 2019).

Notes

[1] Powell and Snellman define a knowledge economy as "*production and services based on knowledge-intensive activities that contribute to an accelerated pace of technical and scientific advance, as well as apid obsolescence. The key component of a knowledge economy is a greater reliance on intellectual capabilities than on physical inputs or natural resources*" (Powell and Snellman, 2004).

[2] Non-oil refers to all sectors except oil extraction and refining.

[3] Court of the Amir.

[4] The evaluation also noted that the outlook for sustainability of the initiatives supported in partnership with KFAS was better, although to be confirmed.

[5] To such an extent that out of the 513 projects announced at the launch of the current MRDP, 421 projects originated from the previous plan. Only 92 new projects would be implemented during the period.

[6] On the English version of the site. The objective in the Arab version (as translated by the Review team) is different, but has the same weakness: "*Enhancing the research facilities of the institute to develop the quality of its outputs to serve the beneficiaries*".

[7] Official statistics for R&D expenditure do not exist. Preliminary figure obtained by consolidation of data from Kuwaiti sources. Includes a very preliminary figure from the KNPC, which is awaiting confirmation/revision.

[8] For a more detailed discussion, please refer to Box 5.18 in Chapter 5.

[9] For reference, it was estimated in the report that R&D intensity was less than 0.2% of GDP in 2007.

[10] A more detailed analysis of KFAS' role as a research and innovation funding body is dealt with in Section 2.5.3.

[11] Two other KFAS centres are the Scientific Centre of Kuwait and the Sabah Al Ahmad Centre for Giftedness and Creativity. These have other missions and no or limited research activities. For a discussion of the Sabah Al Ahmad Centre for Giftedness and Creativity's activities, please see Box 5.16 in Chapter 5.

[12] According to the KCSB Census in 2011, 698 000 non-Kuwaitis were employed in the private sector, 575 000 as household employees, 117 000 in the public sector and 22 000 in other sectors.

[13] The amount is about USD 3 000 per month, but this represents only a fraction of what a government salary would be.

[14] In some cases covered by the KDIPA law, full foreign ownership is possible, but this typically does not apply to individual entrepreneurs.

[15] For a more detailed discussion of KFAS Innovation and Enterprise Directorate's activities, please refer to Box 5.14 in Chapter 5.

[16] Kuwait's Law No. 22 of 2016 Concerning Copyrights and Related Rights (K-CL 22/2016).

[17] www.wipo.int/edocs/lexdocs/laws/ar/kw/kw013ar.pdf.

[18] https://www.export.gov/article?id=Kuwait-Protection-of-Property-Rights.

[19] For a review of the KISR's and KUKU's TTOs' activities, see Box 5.17 in Chapter 5.

[20] For a review of the Scientific Centre of Kuwait and the Sabah Al Ahmad Centre for Giftedness and Creativity's activities, please refer to Box 5.16 in Chapter 5.

[21] For more details, see Boxes 5.3 and 5.4 in Chapter 5.

[22] For more details, see Boxes 5.1 and 5.2 in Chapter 5.

[23] Please note that "technology" start-up businesses in Kuwait usually refer mostly to online retail and service ventures, rather than companies based on commercialisation of proprietary knowledge.

[24] Extract from statement by Sheik Sabah Al-Ahmed Al-Jaber Al-Sabah, 2019.

[25] For a review of the NTEC's activities, see Box 5.18 in Chapter 5.

[26] For a review of the Scientific Centre of Kuwait and the Sabah Al Ahmad Centre for Giftedness and Creativity's activities, please refer to Box 5.16 in Chapter 5.

[27] For a review of KISR's and KU's TTOs' activities, see Box 5.17 in Chapter 5.

[28] For a more detailed discussion of the NTEC, please refer to Box 5.18 in Chapter 5.

[29] Official statistics for R&D expenditure do not exist. Preliminary figure obtained by consolidation of data from Kuwaiti sources. Includes a very preliminary figure from the KNPC, which is awaiting confirmation/revision.

2 Macroeconomic and framework conditions and innovation performance in Kuwait

This chapter first discusses Kuwait's macroeconomic performance, and in particular, the benefits and long-term risks caused by Kuwait's exceptional resource endowment, the diversification challenge, and its labour market and social contract. The second section discusses Kuwait's framework conditions, especially those related to the business environment and entrepreneurship. The last section reviews Kuwait's aggregate innovation performance. It starts by examining input indicators: R&D expenditure across sectors, education input and outcomes, and the availability of human resources for innovation. It then reviews indicators of innovation output to highlight qualitative and quantitative characteristics of Kuwait's innovation system, in particular the quantity and quality of research outcomes, the number of patents, and the share of high R&D-intensive activities in its total exports.

This chapter analyses Kuwait's macroeconomic environment and the framework conditions of its innovation system, as well as its research and innovation inputs and performance output as a backdrop to the assessment of the public research, business innovation and public governance systems that will be developed in the remainder of this review.

2.1. Macroeconomic environment

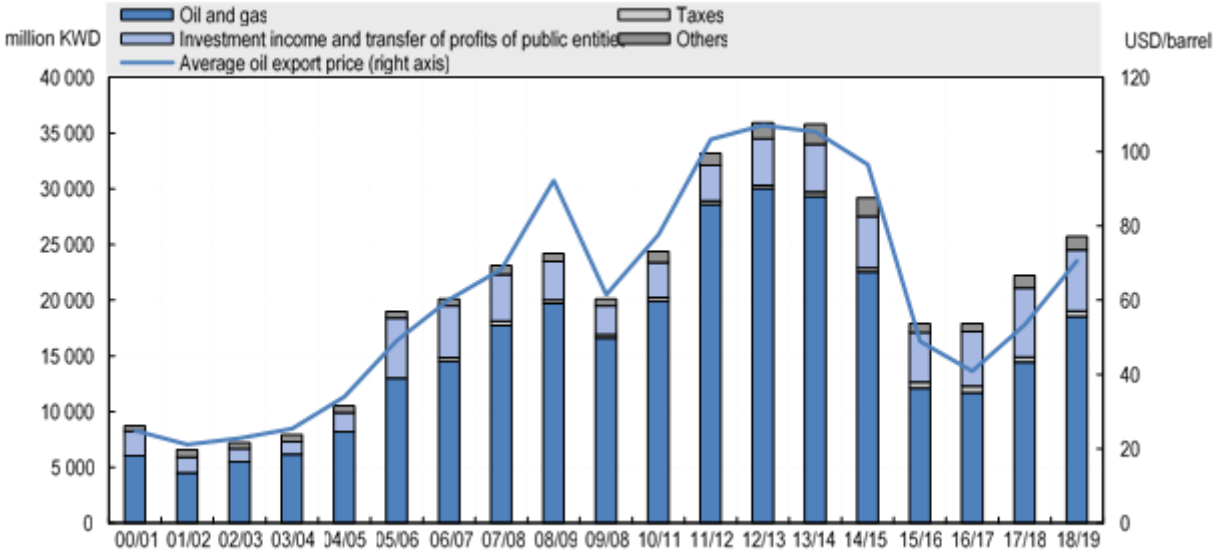
Macroeconomic conditions are critical for a country's innovation system, as a sound and stable macroeconomic environment is a precondition for research, development and innovation and facilitates knowledge diffusion throughout the economy. Innovation performance is, in turn, a key driver of competitiveness, long-term productivity growth and gross domestic product (GDP) per capita growth.

2.1.1. An exceptional resource endowment drives the economy, but bears long-term risks

For the past 80 years, Kuwait's high hydrocarbon endowment has provided the basis for its socio-economic development. Originally a merchant economy at the tip of the Arabian Gulf, since 1938 and the discovery of oil, Kuwait has seen its economic and social development become increasingly dependent on the extraction and exports of this commodity. Thanks to the oil rent, Kuwait has been able to ensure a high level of wealth and well-being for its population. This has also helped Kuwait recover relatively quickly from the Iraqi invasion in 1991 and continue its economic and demographic expansion.

With 101 500 million barrels in 2018, Kuwait holds 6.8% of the world's proven crude oil reserves and ranks fifth – far behind Saudi Arabia which holds 18% of the world's reserves, but ahead of the United Arab Emirates (OPEC, 2019). Kuwait's revenues from oil exports accounted for more than half of its GDP and 64% of government revenues in 2017/18 (Figure 2.1) (IMF, 2019). With a current production-to-reserves ratio of about 1% (i.e. at current production rates, proven reserves are expected to last for 100 years), Kuwait is likely to remain one of the world's leading oil producers in the decades to come (KISR, UNDP and GSSCPD, 2019).

Figure 2.1. Fiscal revenues, Kuwait, 2000-19

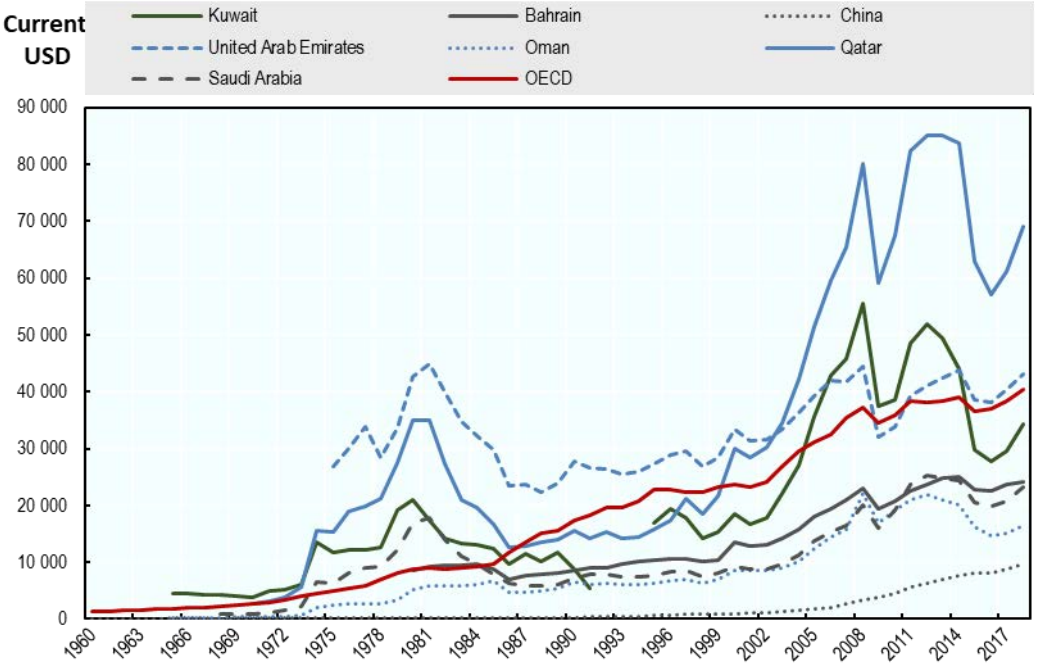


Source: OECD based on IMF **Invalid source specified.**, Kuwait's Article IV Consultation reports.

Like its Gulf Cooperation Council (GCC) neighbours, Kuwait has been able to uphold a social contract whereby regimes promise citizens prosperity, order and freedom to pursue a socially and economically satisfying life. Living standards have improved over time. The Human Development Index scores has improved, from 0.71 in 1990 to 0.81 in 2018 and Kuwait is ranked in the category of countries with "very high human development" (UNDP, 2019). However, it still ranks below all the other GCC countries, which together have a Human Development Index average of 0.85, and is well below the OECD average of 0.90. Other indicators have also improved: infant mortality has fallen steadily, from 15 per 1 000 live births in 1990 to less than 7 in 2018; expected years of schooling have increased by three years, from 10.6 years in 1990 to 13.6 in 2017; mean years of schooling for people aged 25 and older have increased, from 5.3 in 1990 to 7.2 in 2018; and life expectancy at birth rose by almost three years between 1990 and 2017, from 72.1 to 74.8 (UNDP, 2018b). However, Kuwait performs below most other GCC countries on all of these indicators.

Kuwait has one of the highest levels of GDP per capita in purchasing power parity in the world, with almost USD 74 000 per capita in 2018 according to World Bank data. However, while its nominal GDP per capita was three times higher that of the OECD in the early 1970s, it now stands at 0.85 of OECD nominal GDP per capita (Figure 2.2).

Figure 2.2. GDP per capita, Kuwait, 1960-2018



Source: World Bank Data Bank, World Development Indicators, https://databank.worldbank.org.

The unemployment rate in Kuwait is low, at 2.2% of the labour force in 2015. Although it has increased slightly in the past decade or so (from 3.9% in 2003 to 4.7% in 2015), the unemployment rate of Kuwaiti nationals has consistently been below 5% of the labour force (KCSB, 2015). However, this low rate of unemployment hides large differences between age groups, with young people being much more likely to be unemployed than older people. In 2015, 22.1% of Kuwaiti nationals aged 15-24 were unemployed, with women being the most affected (31.5% of Kuwaiti women aged 15-24 were unemployed in 2015) (KCSB, 2015).

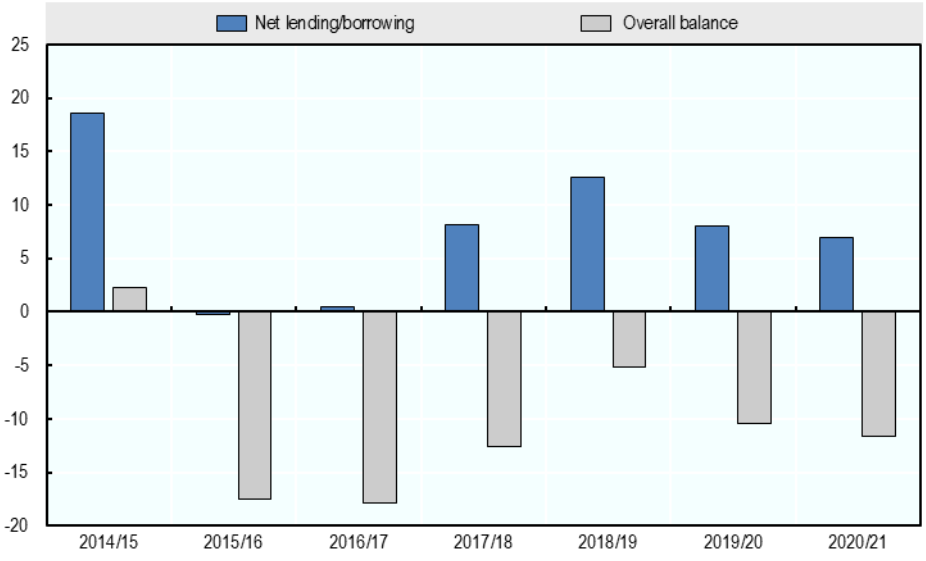
Furthermore, inflation is low (1.5% in October 2019) and the national currency is stable. The budget balance has generally been in surplus since the early 1980s, with only a few exceptions (e.g. in the aftermath of the first Gulf war and following slumps in oil prices in 2014-16) (IMF, 2018). Kuwait has invested the surplus from oil revenues in its sovereign wealth fund established in 1953, the Kuwait Investment Authority (KIA). In 2017, the KIA had around USD 530 billion of assets under management, making it the world's fourth largest sovereign wealth fund, behind Norway's Government Pension Fund Global, the China Investment Corporation and the Abu Dhabi Investment Authority (SWFI, 2019).

However, strong dependence on a single export commodity which drives most of government revenues can also create economic vulnerability due to exposure to price shocks. Furthermore, other factors such as slowing global demand amid global concerns about carbon emissions and the development of renewable energy and sustainable mobility are likely to cause a stagnating, or even decreasing, demand for oil.

Oil price volatility and the persistence of oil price shocks create a high degree of uncertainty in government revenues and have produced large (and sustained) swings in fiscal balances: spending levels have generally followed the movements of oil prices, but not necessarily with the same magnitude (Beidas-Strom, Rasmussen and Robinson, 2011). This also exacerbates volatility in the whole economy, as a decline in fiscal revenues due to falling oil prices often requires cuts in public spending, which may then affect employment in the public sector, as well as growth in the non-oil sector (IMF, 2016). For example, the fall in oil prices led to an overall public deficit of about 18% of GDP (after transfers to the Future Generations Fund and excluding investment income) in the fiscal years 2015/16 and 2016/17 after 16 straight years of surpluses, leading the government to start borrowing to preserve liquid buffers (IMF, 2018). In spite of the rebound of oil prices in 2018/19, this deficit situation is expected to persist, according to the Ministry of Finance's projections (Figure 2.3).

Figure 2.3. Kuwait's fiscal balance, 2014-20

% of GDP



Note: The overall balance is the fiscal balance after transfers to the Future Generations Fund and excluding investment income.
Source: IMF (2019), *Kuwait: Staff Report for the 2019 Article IV Consultation*, https://www.imf.org/~/media/Files/Publications/CR/2019/1KWTEA2019001.ashx.

The wealth in natural resources in Kuwait has also led to a situation of a so-called "resource curse" – a paradoxical situation whereby a country with an abundance of natural resources tends to have less economic growth than countries with fewer natural resources. One particular phenomenon of the resource curse can be Dutch disease (Box 2.1), which leads to the appreciation of the domestic currency and a loss of competitiveness in the non-resource sectors. The KIA invests part of the surplus from oil revenues in various assets – in foreign countries – to ensure stable revenues for future generations, while avoiding asset price inflation in Kuwait.

Box 2.1. Dutch disease: Definition

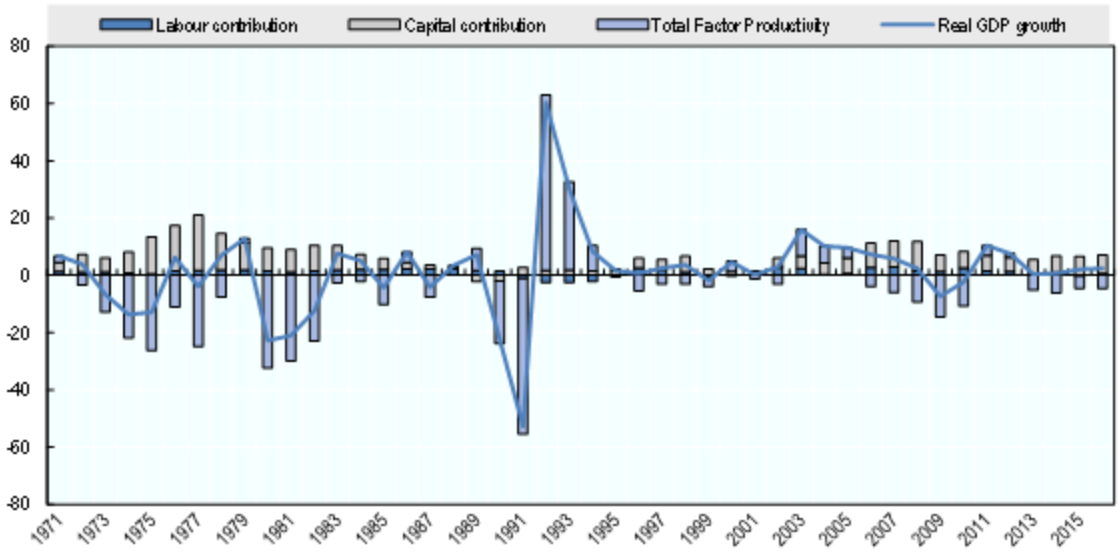
The Dutch disease theory describes how the increase in a country's revenues from one specific sector (natural resources, for example) can cause an appreciation of the national currency, resulting in the nation's other exports becoming less competitive.

The term was first mentioned in The Economist in 1977 to describe the decline in the manufacturing sector in the Netherlands following the discovery of the Groningen natural gas field in 1959 (2.8 trillion cubic metres of natural gas). Gas exports had led to large inflows of foreign currency, thereby increasing demand for the national currency (the guilder) and making it stronger, hitting the competitiveness of Dutch manufacturing and services (The Economist, 1977).

Nevertheless, Kuwait has not managed to escape the "resource curse" and has experienced a drastic fall in productivity over the past half century. While its GDP per worker exceeded five times that of the United States in the 1970s, they were at a par in 2010 (Cherif and Hasanov, 2014a). Furthermore, real GDP growth in Kuwait has been driven by rapid factor accumulation, especially by capital which has been growing faster than GDP itself. As a result, total factor productivity[1] (TFP) has strongly contracted (Figure 2.4). Growth in TFP is measured as a residual of the production function, i.e. the part of GDP growth that cannot be explained by growth in capital and labour inputs, and is thus generally considered as indicative of innovation and technological progress. TFP growth is therefore key to drive long-term economic growth. Worryingly, while TFP has dropped in all other GCC countries, Kuwait is the country for which TFP growth has dropped the most since 1970 (Figure 2.5).

Figure 2.4. Decomposition of real GDP growth, Kuwait, 1971-2015

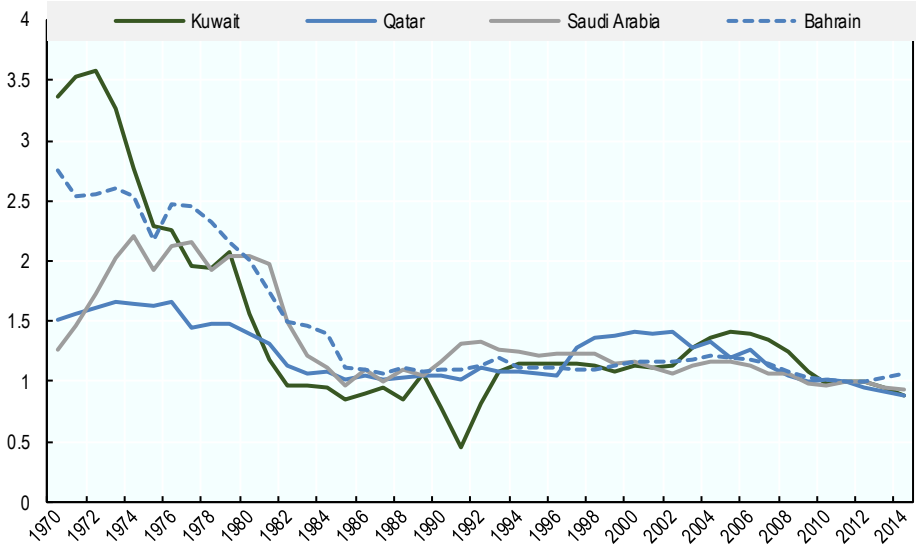
Annual percentage point contribution to real GDP growth



Source: The Conference Board (n.d.), *Total Economy Database™*, https://www.conference-board.org/data/economydatabase/index.cfm?id=27762.

Figure 2.5. Evolution of total factor productivity in Kuwait and other Gulf Cooperation Council countries, 1970-2014

Total factor productivity at constant national prices, index 2011=1

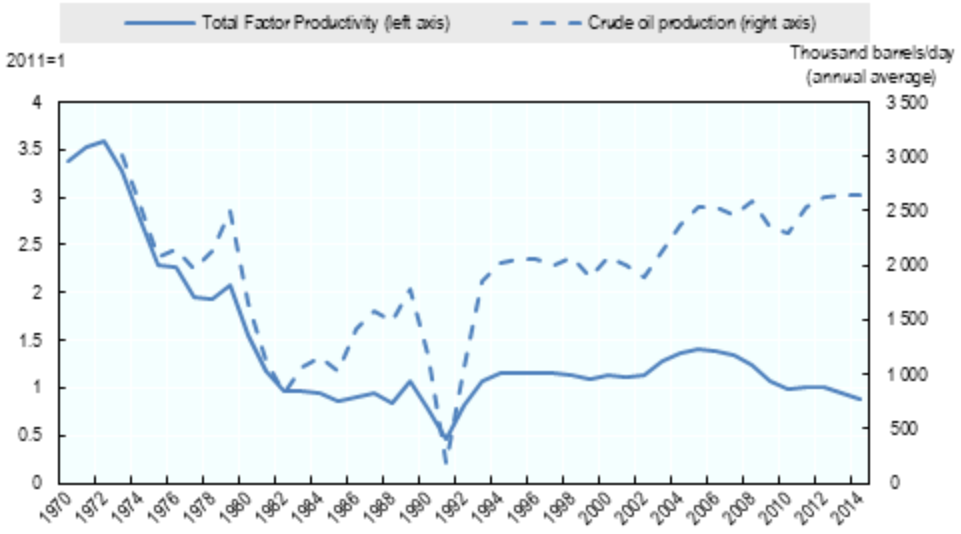


Source: University of Groningen and University of California, Davis, retrieved from FRED, Federal Reserve Bank of St. Louis.

However, in a resource-driven economy such as Kuwait, this figure has to be interpreted with caution. Initially, the productivity curve closely follows the oil production, but starting from the 1980s, the TFP does not fully reflect increases in oil production (Figure 2.6). This is symptomatic of large increases in labour

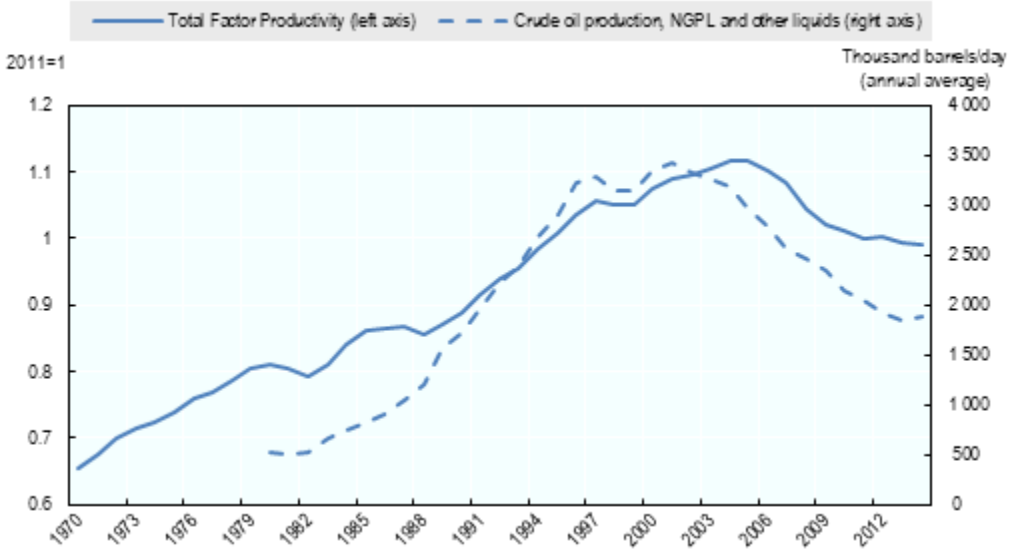
and capital, which have not driven GDP growth productively. In order to increase the TFP, Kuwait would need to reinvest capital and transfer labour into high value-added activities, typically knowledge-intensive industries. In the case of Norway, the TFP is also strongly correlated to hydrocarbon production. However, the TFP curve managed to hold in a falling production environment, as shown in Figure 2.7.

Figure 2.6. Evolution of total factor productivity and oil production in Kuwait, 1970-2014



Source: University of Groningen and University of California, Davis, retrieved from FRED, Federal Reserve Bank of St. Louis.

Figure 2.7. Evolution of total factor productivity and oil production in Norway, 1970-2012



Source: University of Groningen and University of California, Davis, retrieved from FRED, Federal Reserve Bank of St. Louis.

2.1.2. The diversification challenge

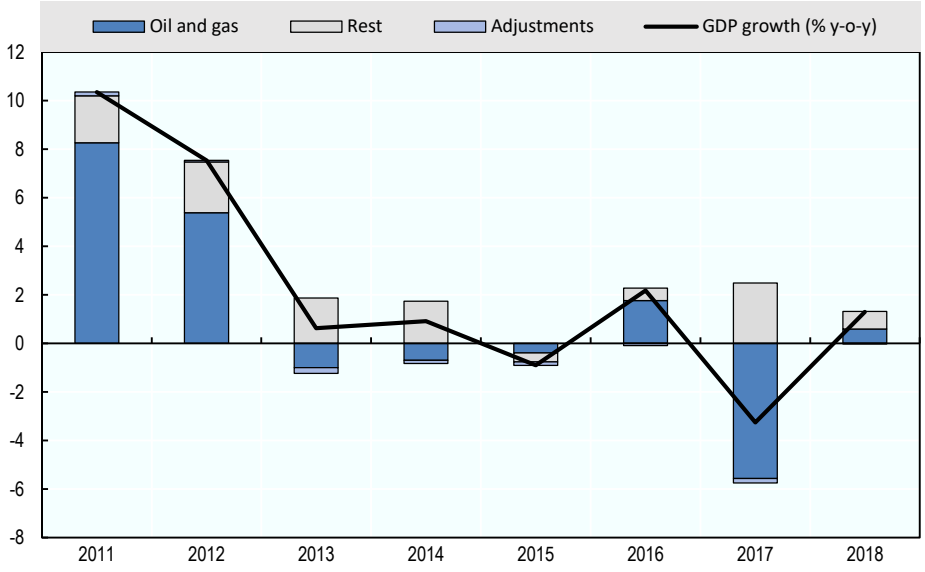
A sustainable economy enhances a nation's standards of living by creating wealth and jobs, encouraging the development of new knowledge and technology, and helping to ensure a stable political climate. Having a diverse economy, i.e. one based on a wide range of profitable sectors rather than only a few, has long been thought to play a key role in fostering sustainable economic growth. Most importantly, diversified economies perform better over the long term.

Diversification is needed to hedge against market risk and mitigate the exposure of Kuwait's economy to oil price fluctuation. Diversification can also provide productive jobs for the Kuwaiti population, especially since the oil-producing sector is structurally capital-intensive, not labour-intensive, and cannot provide enough productive jobs for all Kuwaitis. Not only is diversification needed to mitigate the effects of oil price variations, it is also essential to prepare for when oil export revenues will not be able to sustain future generations' standard of living.

Decomposition of GDP growth in the past few years shows that GDP growth in Kuwait has strongly been driven by variations in the output of the oil sector (Figure 2.8). This is especially an issue as the oil sector accounts for about half of total GDP. The challenge is therefore to expand non-oil sectors that can provide a sustainable source of growth and employment.

Figure 2.8. Contribution of oil and non-oil sectors to GDP growth in Kuwait, 2011-18

Annual percentage point contribution to real GDP growth



Notes: GDP in constant prices. The contribution of one sector to GDP growth is measured as the growth in this sector's output multiplied by the share of this sector in total GDP.
Source: OECD calculations based on Kuwait Central Statistical Bureau.

The issue has been raised for a long time in Kuwait. In 2010, the Kuwait Vision 2035 (General Secretariat of the Supreme Council for Planning and Development, n.d.) was formulated with the aim to:

> *(…) transform Kuwait into a financial and trade hub, attractive to investors, where the private sector leads the economy, creating competition and promoting production efficiency, under the umbrella of enabling government institutions, which accentuates values, safeguards social identity, and achieves human resource development as well as balanced development, providing adequate infrastructure, advanced legislation and inspiring business environment.*

However, little impact of this diversification policy has so far been observed. The share of oil and gas has decreased slightly in the past few years, from 49% of GDP (before adjustments) in 2010 to 47% in 2018. However, the priority sectors identified in the Kuwait Vision 2035 – financial intermediation and insurance and wholesale and retail trade – grew at an average annual rate of 0.6% and 0.4% respectively between 2010 and 2018, and their share in total GDP decreased. The share of financial intermediation and insurance in total GDP fell from 9.3% in 2010 to 8.2% in 2018, while the share of retail and wholesale trade decreased from 4.0% in 2010 to 3.5% in 2018 (Table 2.1).

The non-oil sector grew by about 2.7% annually between 2010 and 2018 and its share in the total GDP (before adjustments) rose slightly, from 50.8% in 2010 to 52.6% in 2018. The largest non-oil sector is the public administration and defence sector, which represents 10.9% of the total GDP (and 18.2% of the non-oil economy) and grew by about 5.6% per year. However, as government revenues are in majority driven by oil, this sector also depends heavily on oil and oil prices.

The non-oil manufacturing sector has also grown strongly, by about 4.0% per year between 2010 and 2018, but accounts for only 6.9% of total GDP. Other fast-growing sectors include electricity, gas and water (9.2% per year), and health and social work (5.0%).

Table 2.1. Breakdown of real GDP by economic activity, Kuwait, 2010-18

In constant prices

Economic activity	2010		2018		2010-18
	Million KWD	%	Million KWD	%	CAGR
Oil and oil product sectors	**18 483.9**	**49.2[1]**	**21 253.7**	**47.4[1]**	**1.8**
Non-oil sectors	**19 079.9**	**50.8[1]**	**23 586.4**	**52.6[1]**	**2.7**
Agriculture and fishing	149.4	0.5	178.6	0.5	2.3
Extraction of crude oil petroleum and natural gas and service activities incidental to oil and gas	18 483.9	55.9	21 253.7	54.1	1.8
Manufacturing	1 977.4	6.0	2 718.8	6.9	4.0
Electricity, gas and water	662.3	2.0	1 337.2	3.4	9.2
Construction	730.3	2.2	838.9	2.1	1.7
Wholesale and retail trade	1 338.2	4.0	1 378.4	3.5	0.4
Hotel and restaurant	272.4	0.8	317.3	0.8	1.9
Transport	1 152.5	3.5	1 094.0	2.8	-0.6
Telecommunications	1 229.8	3.7	1 305.5	3.3	0.7
Financial intermediation	3 092.2	9.3	3 230.9	8.2	0.6
Other services	3 253.2	9.8	3 682.2	9.4	1.6
Public administration and defence	2 780.3	8.4	4 285.8	10.9	5.6
Education	1 329.4	4.0	1 733.3	4.4	3.4
Health and social work	764.1	2.3	1 127.1	2.9	5.0
Household with employed persons	348.6	1.1	358.4	0.9	0.3
Sub-total	**37 563.9**		**44 840.1**		**2.2**
Adjustments: FISIM, taxes, subsidies	-4 484.7	-13.6	-5 577.2	-14.2	2.8
Gross domestic product at market value	**33 079.2**	**100**	**39 262.8**	**100**	**2.2**

1. The oil and non-oil sectors' shares are the shares of the GDP sub-total (i.e. before adjustments of FISIM, taxes and subsidies).
Note: CAGR: compound annual growth rate; FISIM: financial intermediation services indirectly measured.
Source: OECD calculations based on Kuwait Central Statistical Bureau.

Sustainable growth is importantly driven by export diversification and sophistication of countries (Cherif and Hasanov, 2014[b]). Kuwait's goods exports reveal limited diversification. According to the revealed comparative advantage (RCA), which measures a product's share in a country's export in relation to its share in world trade,[2] fuels is the only sector where Kuwait has a comparative advantage, while the other

sectors experienced very limited or no competitiveness improvement in the period 2010-17. The RCA in fuels rose from 6 to almost 8, while the RCA in chemicals (the second highest) increased from 0.43 to 0.53 during the period and the RCA in plastic and rubber slightly decreased, from 0.41 to 0.38 between 2010 and 2017 (Table 2.2).

Table 2.2. Top five sectors ranked by revealed comparative advantage in Kuwait, 2010 and 2017

No.	Sector	2010	2017
1	Fuels	5.98	7.89
2	Chemicals	0.43	0.53
3	Plastic or rubber	0.41	0.38
4	Metals	0.07	0.07
5	Stone and glass	0.15	0.06

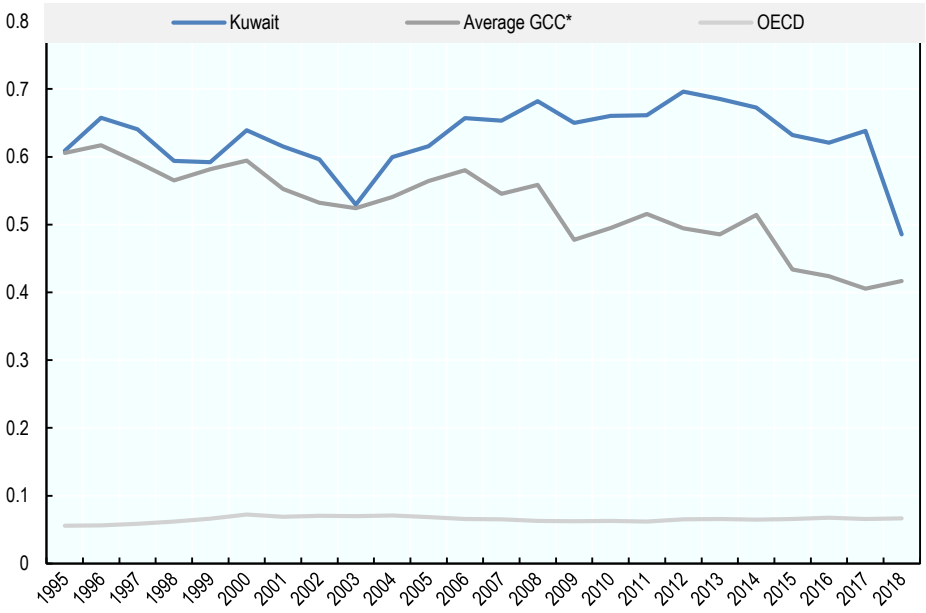
Source: *World Integrated Trade Solutions (WITS) database*, https://wits.worldbank.org.

According to UNCTAD data, Kuwait's exports in services grew strongly in the years leading to 2008, soaring by 77% in 2006 and 20% in 2007 (in current prices), with ICT services – a sector critical for innovation due to its high knowledge content – accounting for about half of all services exports. However, exports in services suffered a sharp drop between 2009 and 2017, decreasing by 55% over the period.[3]

Another indicator of diversification is the level of export concentration. The more exports are concentrated on a few products, the less diversified an economy is. According to UNCTAD's concentration index,[4] Kuwaiti exports had remained as concentrated on oil as they were two decades ago, with an export concentration level of between 0.59 and 0.70 until 2018, when the index dropped to 0.49 from the previous years' level of 0.64. Other GCC countries have been able to diversify away from oil more than Kuwait. For example, Oman's export concentration index fell from 0.75 in 1995 to 0.45 in 2018, Saudi Arabia's concentration decreased from 0.69 to 0.56 in the same period, and the United Arab Emirates' dropped from 0.57 to 0.23 (Figure 2.9), as these countries' exports diversified into downstream oil chemicals, plastics, as well as metals and metal products.

Figure 2.9. Export concentration index, Kuwait, 1995-2018

Export concentration as measured by the Herfindahl-Hirschmann Index



Note: The Herfindahl-Hirschmann Index (HHI) is normalised to 1 for an economy which would export one single commodity. A diversified economy has a value of HHI that tends towards zero. Average GCC is the unweighted average of the indexes for Bahrain, Oman, Qatar, Saudi Arabia and the United Arab Emirates.
Source: UNCTAD (2019), Beyond 20/20 WDS - Documentation.

Kuwait is not the only resource-rich country having trouble diversifying its economy. International experience has shown that diversifying away from oil is often very difficult, with only a few successful examples (Callen et al., 2014). Dubai is one example of successful diversification and has diversified its economy into logistics, transportation, tourism and real estate thanks notably to its business-friendly and favourable regulatory environment and its modern infrastructure (Callen et al., 2014).

These successful experiences of diversification, and in particular those of Indonesia, Malaysia and Mexico, suggest that it requires several decades of preparatory work to develop a non-oil tradable sector (typically 20-30 years to achieve high export sophistication). In the case of Malaysia, for example, an export-oriented strategy started in the early 1970s and encountered rapid growth in export sophistication in the 1980s-1990s (Callen et al., 2014). Successful diversification has also been achieved through a policy mix of promoting vertical diversification in oil and gas and petrochemicals, as well as horizontal diversification in other sectors, through an emphasis on technological upgrade and competition in international markets (Cherif and Hasanov, 2014). In the case of Kuwait, achieving horizontal diversification through an export orientation of the non-oil economy is even more important given that the relatively small size of the domestic market might not be able to generate sufficient demand by itself to drive the development of the non-oil private sector (Alsharif, Bhattacharyya and Intartaglia, 2017).

Furthermore, diversification requires strong political will. Kuwait might be tempted to continue relying on oil primarily and launch diversification policies in reaction to shocks and consider the necessity of economic reform and structural adjustment only when oil prices are down and the government faces budgetary pressure. This is also why, in general, economic diversification truly starts when oil reserves and/or revenues start to diminish (Callen et al., 2014). In Kuwait, this will not happen through reserves depletion since reserves are sufficient for another 100 years of production at current levels. However, diversification

might well be driven by the demand side, since the gradual global transition away from fossil fuels will affect world demand for oil and foster economic diversification.

2.1.3. Kuwait's labour market and the social contract

Oil dependence and the structure of the labour market in Kuwait are closely intertwined, as a large share of jobs is provided by the government and is financed through oil revenue. Kuwait's large oil endowment, combined with the relatively small proportion of Kuwaiti citizens in the total population (about one-third of the total population in 2015, according to data from the Kuwait Central Statistical Bureau [KCSB]) has led Kuwait to be in a position of very strong rentierism. This is also what constitutes the basis for the social contract between the "rulers" and the "ruled", as seen also in other GCC countries (Hertog, 2013), whereby rulers provide citizens with oil revenues mainly through highly paid jobs in the public sector (government, administration and state-owned enterprises), scholarships, subsidies for energy, utilities and basic needs, and more generally high living standards, while citizens offer loyalty and support to the regime in exchange.

This rentierism has resulted in a dual job market, one for Kuwaiti citizens and another for foreigners, with Kuwaiti citizens mostly working in the public sector (92.0% of Kuwaitis worked for the government or government-owned establishments in 2015) and foreigners in the private sector (74.8% of foreigners worked for the private sector and 17.0% for the household sector in 2015). In 2018, 75% of employees in the government sector were Kuwaitis and 25% non-Kuwaitis, according to KCSB's statistics of the government sector. Of these non-Kuwaiti government employees, 47% work in the Ministry of Public Health and 38% in the Ministry of Education.

Government jobs for nationals are subject to very little competition and can be considered largely as a redistribution of the oil rent. Private sector companies, on the other hand, mostly hire expatriates and wages are much lower and aligned to be attractive enough for workers from the low-wage countries it seeks to attract (mostly Asian and Arab countries). Jobs in the private sector are subject to performance requirements and competition and are typically unattractive to Kuwaiti nationals, especially as the public sector jobs set a "reservation wage" below which Kuwaiti citizens would rarely work (Herb, 2009). The government offers a specific stipend, called "workforce support" (*daam amala* in Arabic) to Kuwaiti nationals who accept to work in the private sector, in order to compensate for the wage gap between the two markets. However, as long as they have the possibility to do so, most Kuwaitis prefer to work in the public sector, especially as they think working conditions in the public sector are much better than in the private sector (Salih, 2010).

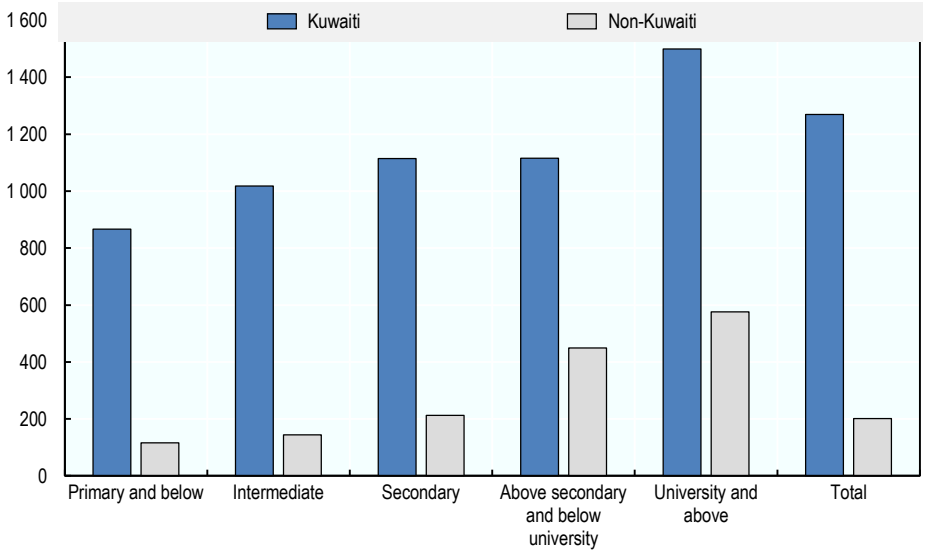
The duality of the labour market does not come only from the supply side (workers), it also comes from the demand side (employers). Companies in the private sector tend to rely on a cheaper and easier-to-adjust expatriate workforce, rather than nationals with a higher reservation wage and stronger social protection expectations. It is also much easier for private companies to hire trained expatriates and dismiss them when other skills are needed. "Kuwaitisation" has thus sought to replace expatriates with nationals in certain categories of jobs. In the private sector, this is mainly achieved through quotas of Kuwaiti workers (depending on the economic activity of the company), with penalty fees for not complying. In government-related enterprises and systems, the approach is to give priority to Kuwaitis for the jobs available. Conversely, expatriates are also offered public sector employment in areas where domestic labour supply is insufficient – typically high-skilled occupations in education and health services.

The job market duality is also illustrated by the difference in monthly wages, with the median monthly earnings (including basic salary and various allowances) nine times higher for Kuwaitis than for non-Kuwaitis (KWD 1 113 vs. KWD 120 per month). The wage gap decreases when the level of education increases, but is still 2.8 times more for workers with a university education. A Kuwaiti with a university or more education level earns KWD 1 350, while a non-Kuwaiti earns an average of KWD 490, 1.7 times less than what an uneducated Kuwaiti is earning (Figure 2.10). Within the government sector, this gap is somewhat reduced, but Kuwaitis still make more than twice the earnings of non-Kuwaitis.

These wage gaps deter entrepreneurship and innovation, as it would make no economic sense for a Kuwaiti national to create a company, forego lucrative employment in the public sector and subsist only on a small stipend until the company can generate revenue and sustain the entrepreneur. Furthermore, the National Fund can provide a loan to an entrepreneur only if the entrepreneur does not plan on bringing a non-Kuwaiti on board. For non-Kuwaitis, incentives to start a new company are even more off-putting: non-Kuwaitis need to partner with a Kuwaiti to be able to register a company and have an equity stake limit of 49%.

Figure 2.10. Median monthly wages, Kuwaiti and non-Kuwaiti, by education level, 2015

In KWD



Source: KCSB, Labour Force Survey.

The duality of the Kuwaiti labour market has also been reinforced by the social contract between the government and the citizens. Kuwait has developed a unique model of democracy with free elections for parliament. It is a hybrid system divided between a government appointment by the Amir and a national elected assembly with near universal adult suffrage for citizens. The Kuwaiti parliament is the strongest among GCC countries and one of the strongest in the Arab world and it plays a critical role in Kuwait's policy making: it has the power to interpellate government members and to have votes of no-confidence in individual ministers (Herb, 2009). With few citizens employed in the private sector and almost no taxes from private businesses financing public services, interests of Kuwaiti citizens and the private sector have been diverging, leading parliament to pursue populist public employment and subsidy policies, while undermining attempts to support diversification driven by the private sector (Hertog, 2013).

The Kuwaiti government has been able until now to direct its budgets towards the creation of public sector jobs for its citizens. However, with 32% of its population under 25 years old (United Nations, 2019), it will become increasingly difficult to create enough public sector jobs for all the workers entering the labour market without creating a high, potentially unbearable, fiscal cost. As already seen above, in 2015, the unemployment rate was 4.7% for Kuwaiti nationals and 1.8% for non-Kuwaitis according to the KCSB Labour Force Survey. Increasing private sector job creation for nationals is therefore all the more necessary.

Various measures have been implemented to decrease the labour market divide, in particular addressing the wage distortions and reducing the wage gap, but the labour market in Kuwait remains divided. Privatisation can also drive the reduction in the labour market divide and has become one of the priorities of the government as described in the New Kuwait Plan. But more needs to be done, especially on the education and skills front in order to increase the employability of Kuwaiti nationals, especially as Kuwait performs poorly in terms of education outcomes (see Section 2.3).

2.2. Framework conditions in Kuwait

2.2.1. The role of framework conditions

The 2010 Innovation Strategy (OECD, 2010b) stressed the importance of sound framework conditions to foster innovation. The importance of these framework conditions has increased in recent years, especially as businesses and capital have become more mobile and seek the most favourable operating environments internationally. The OECD Innovation Imperative (OECD, 2015b) has identified several new issues relevant for framework conditions which need to be tackled to create a good basis for the innovation ecosystem.

The framework conditions for innovation include:

- Sound macroeconomic conditions: in particular, fiscal and monetary stability and low and stable inflation help reduce uncertainty and enhance the efficiency of resource allocation.
- Open and competitive markets: elimination of anti-competitive product market regulations as well as proactive competition policies in line with international best practices are powerful ways to stimulate investment in innovation. Indeed, if markets are insufficiently competitive, companies will enjoy rent situations in domestic markets, which are not conducive to innovation and competitiveness in international markets.
- Sound regulatory framework: to facilitate the generation of new technologies and foster their rapid diffusion.
- Innovation-friendly tax systems which create the right incentives for innovation: tax policies related to investment in knowledge-based assets, in particular, have important impacts on the decision of firms to invest in innovative activity.
- Openness to international trade and integration into international value chains: greater openness can lead to increased knowledge diffusion and absorption via various channels, including imports of goods and services, investment flows, mobility of workers, and collaborative research and innovation. Furthermore, the growing importance of global value chains and their implications for framework conditions that affect innovation, notably concerning trade, investment and regulatory policies, underscores the importance of openness.
- Well-developed financial markets and easy access to finance for new and innovative small firms: econometric analysis suggests that the scale of financial development, stock market capitalisation and the share of corporate profits in GDP have significant positive effects on R&D expenditure (Jaumotte and Pain, 2005). Innovation activity also requires medium- to long-term investment and planning in order to decide on the relatively long innovation cycle from product inception to market launch and return on investment. A stable financial system is therefore crucial to ensure investment in innovation. Furthermore, bank credit is typically not well-suited for financing innovation, and equity instruments, such as venture capital, are needed, especially for young, technology-based firms with high growth potential.
- Favourable business environment conditions, with, in particular, high ease of starting and doing business.

- Right skills and culture: an appropriate education system is crucial to provide the adequate skills which enable the workforce to be innovative. Importantly, innovation requires enhancing human capital, by encouraging both technological prowess and a culture of experimenting and risk-taking in order to create new business models using technology.
- Framework conditions to benefit from investment in knowledge-based capital: in several OECD countries, investment in knowledge-based capital – software; data; intellectual property; and economic competencies such as brand equity, new organisational methods and firm-specific skills – is now larger as a proportion of GDP than investment in tangible capital. A sound international framework for intellectual property rights, together with the effective enforcement of these rights, is key to foster innovation.

2.2.2. Room for improvement for innovation framework conditions in Kuwait

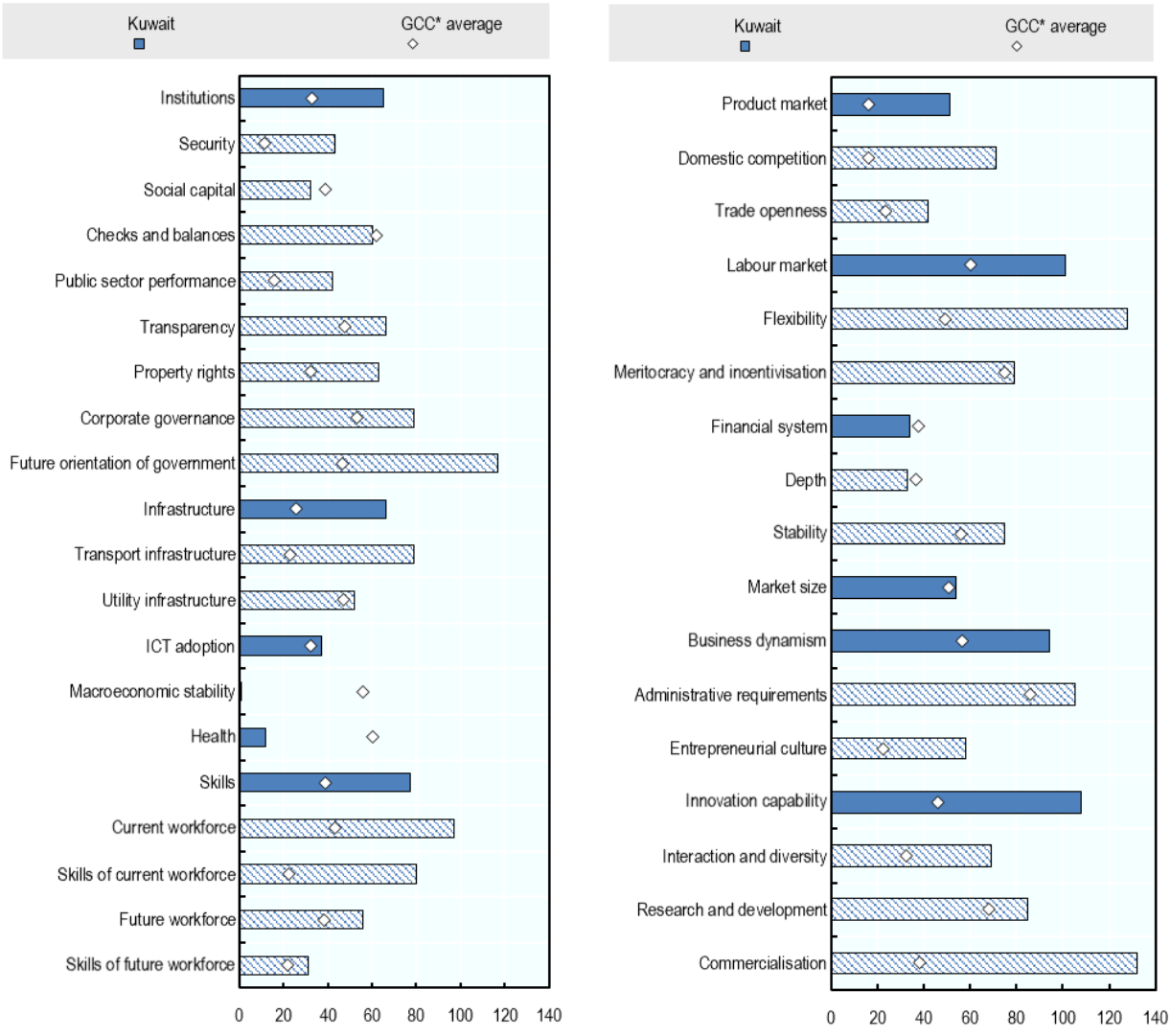
Business environment reform is seen as a top governmental priority. It is being overseen by the Permanent Committee for Streamlining Business Environment and Enhancing Competitiveness in the State of Kuwait, a platform that brings together the private sector, civil society and 15 governmental entities, co-ordinated by the Kuwait Development and Investment Promotion Agency (KDIPA).[5]

Kuwait has recently improved it position in global rankings of its innovation system and framework conditions, but there is still room for improvement. In its latest *Doing Business 2020 Report*, the World Bank ranks Kuwait 83rd out of 190 countries, a significant improvement from its rank of 97th the year before, but still below all other GCC countries (the United Arab Emirates ranks 16th, Bahrain 43rd, Saudi Arabia 62nd, Oman 68th and Qatar 77th). Most significant improvement is needed in starting a business (82nd), getting credit (119th) and trading across borders (162nd) (World Bank, 2019).

Small and medium-sized enterprises (SMEs) and new businesses are fundamental to any national innovation system, as they bring new ideas into the market and play a central role in creative destruction, knowledge spill over, and breakthrough and incremental innovation (OECD, 2010a). In Kuwait, the number of procedures and days to start a business are particularly high (5.5 and 19.5 respectively – a significant improvement compared with previous years, especially in terms of days to start a business, which was 35.5 only one year before, but still higher than 2.5 procedures and 4 days on average to start a business in the United Arab Emirates) (World Bank, 2019). In order to make the process of starting a business easier, Kuwait has recently implemented a number of reforms, in particular: it eliminated the paid-in minimum capital requirement (World Bank, 2018), merged procedures to obtain a commercial license and streamlined online company registration (World Bank, 2019).

Likewise, in the World Economic Forum's *Global Competitiveness Report 2019* (Schwab, 2019), Kuwait performs significantly below its GCC peers in almost all dimensions of the index except for 3 of the 12 pillars (macroeconomic stability for which Kuwait ranks 1st, and health and the financial system). The pillars for which Kuwait performs the less than the GCC average are: innovation capability, labour market, infrastructure and product market (Figure 2.11). The New Kuwait Plan has set ambitious objectives in that regard: from the 108th rank in 2020, Kuwait should reach the 49th position in 2035 in terms of innovation capabilities.[6]

Figure 2.11. Kuwait's ranking in the World Economic Forum's Global 2019 Competitiveness Index compared to the average of other Gulf Cooperation Council (GCC) countries



Notes: A lower score is better. The blue bars are the 12 pillars of the World Economic Forum's Global Competitiveness Index. The dashed bars are the sub-components of these pillars. GCC average is the unweighted average of the rankings of Bahrain, Oman, Qatar, Saudi Arabia and the United Arab Emirates.
Source: Schwab, K. (ed.) (2019), *The Global Competitiveness Report 2019*, www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf.

2.3. Innovation performance

The assessment of the innovation performance of a country takes into account a wide range of indicators, including input indicators such as research and development (R&D) expenditure, and educational and skills characteristics across the population, as well as output indicators such as scientific publications and patents.

2.3.1. Innovation inputs

The ability to mobilise resources for innovation differs markedly across countries. Innovation-intensive countries devote considerable financial resources to invest in R&D, skills for innovation, and science and technology.

R&D expenditure and intensity

The amount of money spent on research and experimental development (R&D expenditure) is of considerable interest to policy makers. In particular, such statistics are used to measure who conducts and who funds R&D and where it takes place, the level and purpose of such activities, and the interactions and collaborations between institutions and sectors. R&D comprises creative and systematic work undertaken in order to increase the stock of knowledge – including knowledge of humankind, culture and society – and to devise new applications of available knowledge (OECD, 2015a).

Intramural R&D expenditures are all current expenditures (including labour and other costs) plus gross fixed capital expenditures (such as for land, buildings, machinery and equipment) for R&D performed within a statistical unit during a specific reference period (OECD, 2015a). The main aggregate used to describe a country's R&D activities is gross expenditure on R&D (GERD), which covers all expenditures for R&D performed in the national territory during a specific reference period.

GERD is usually constructed by summing the intramural R&D expenditure totals for the following four main performing sectors: 1) business enterprise; 2) government (government laboratories and various types of research institutes with public missions); 3) higher education; and 4) private non-profit (OECD, 2015a).

Little comprehensive information is available on science, technology and innovation funding in Kuwait, and especially on research and experimental development expenditure. Information is fragmented and partial, due in part to the absence of a centralised or aggregated budget dedicated to science, technology and innovation (STI). According to the available evidence, there is no budget dedicated *ex ante* to STI activities in the different line ministries. Neither are there robust *ex post* consolidated expenditure statistics in line with international norms.

At the outset of this project, different sources estimated Kuwait's R&D intensity, i.e. total R&D expenditure divided by GDP, to lie between 0.1% and 0.5%, i.e. between KWD 34 million and 170 million (between USD 112 million and 560 million). In particular, the Kuwait Foundation for the Advancement of Sciences (KFAS) recently estimated that R&D intensity in 2017 was below 0.3%, with a breakdown of 0.19% funded by government, under 0.1% by the private sector and less than 0.01% by other sectors. However, these numbers for Kuwait are likely to not have taken all data into account, especially the expenditure in R&D performed and funded by businesses.

This study used primary data provided by Kuwaiti research actors, including firms involved in the dedicated innovation and R&D survey, in order to provide an estimate of overall R&D expenditures in Kuwait. However, this consolidation of data from various Kuwaiti sources should be taken with caution as it depends on hypotheses (including notably on the time spent by faculty members on research activities) and on the results of the first R&D survey in Kuwait. Providing a robust measure of GERD would necessitate a stronger endeavour to collect, process and publish data according to recognised international standards with regards to statistics on research and experimental development [R&D (OECD, 2015a)] and innovation (OECD/Eurostat, 2019).

In order to understand the innovation performance of the Kuwaiti business sector, a dedicated innovation and R&D survey was conducted in Kuwait: the first phase of the survey was conducted in 2018 and the second in 2019, where the sample was complemented by a set of younger enterprises which were not well represented in the sample used in the first phase. The survey was conducted by the KCSB, with strong support from KFAS and external help by the consulting company GOPA. This survey provides information

for a sample of businesses classified by Kuwait's Central Bureau of Statistics and for a sample of young enterprises (less than ten years old) made available by the company Cedar Rose. Valid responses were received from 2 326 businesses.

Among these companies, 21% reported some expenditure in R&D. The total spend in R&D by these companies amounts to KWD 16.4 million (i.e. USD 54.0 million). This number is likely to be an estimate of the minimum total business expenditure for R&D, especially as major economic players from the business sector, such as Kuwait Petroleum Corporation, did not take part in the survey. However, it is the best estimate that can be given at this stage, given some uncertainties around the quality of the data received and the statistical biases likely to be inherent to this survey. In particular, the results are not statistically representative of the overall population of enterprises in Kuwait, as it is likely that the enterprises which responded to the survey are more prompt to innovate than the ones which did not, thereby creating a self-selection bias. Furthermore, a tentative extrapolation to the whole economy, which is methodologically questionable due to the issues mentioned above, would result in about a doubling of this figure, from around 0.04% of GDP to 0.07%, which would not change the total GERD significantly.

Other channels of R&D funding in Kuwait exist, but are fairly limited. Kuwait University, for example, received about KWD 105 000 of funds from a joint contribution from KFAS and Massachusetts Institute of Technology in 2017/18. The Kuwait Institute for Scientific Research also receives external funding in addition to institutional funding. It amounted to KWD 5.5 million in 2017/18 and to KWD 8.2 million in 2018/19.

Taking all of this into account, the bottom-up recollection of the expenditure components of R&D points to an overall number for domestic R&D expenditure of between KWD 120 million and KWD 135 million, i.e. 0.33-0.37%[7] of GDP. This is lower than estimates for Saudi Arabia (0.8% of GDP according to UNESCO data) and the United Arab Emirates (0.7% of GDP), and much lower than the OECD average, which spent 2.4% of GDP on R&D in 2017.

Table 2.3 summarises the elements of R&D funding in Kuwait obtained from data gathered from various sources and described above.

Table 2.3. Rough estimate of R&D expenditures in Kuwait, 2017

Main channels	Funding estimates of R&D
Kuwait University (KU)	KWD 24.4 million including: – KWD 4.0 million (research budget 2017/18, including externally funded projects) – KWD 20.4 million (human resource cost estimate, see notes)
Public Authority for Applied Education and Training (PAAET)	KWD 12.2 million in 2017: – KWD 0.3 million (research budget based on value of internally and externally funded projects) – KWD 11.9 million (human resource cost estimate, see notes)
Kuwait Institute for Scientific Research (KISR)	KWD 53.3 million in 2017/18 (research budget, excluding construction)
Dasman Diabetes Institute	KWD 4.1 million
Jaber Al Ahmed Centre for Molecular Imaging and Nuclear Medicine	KWD 0.9 million
Other public institutions	KWD 5 million (estimate based on Kuwait Foundation for the Advancement of Science grants data, excluding KISR, KU and PAAET)
Business expenditure for R&D	KWD 25-40 million, including: – KWD 15-30 million (R&D survey estimate)
Total	**KWD 120-135 million**

Notes: KU research budgets include costs of equipment, consumables and wages of the few temporary and permanent researchers. The human resource cost is estimated on the basis of 30% of the faculty payroll (the 1 591 faculty members are expected to devote 30% of their time to research, according to KU rules) and a rate of overheads of 30% (in line with average international practices).
The PAAET's research budget is calculated based on the hypothesis that 1 527 faculty (professors and assistant professors and other teaching staff) devote 20% of their time to research. Using an average annual wage of KWD 30 000 and a 30% overhead rate, the staff cost of research is thus estimated at KWD 11.9 million = 1 527*30 000*0.2*1.3.
Business expenditure for R&D is based on the R&D survey conducted by the Kuwait Central Statistical Bureau and the Kuwait Foundation for the Advancement of Science in 2018/19. The lowest value corresponds to the survey data collected from the sample of surveyed companies, non-extrapolated.
Sources: Kuwait University, Kuwait Institute for Scientific Research, Kuwait Foundation for the Advancement of Science, Kuwait Central Statistical Bureau, and the Supreme Council for Planning and Development.

Education and training

Investment in human capital is key for innovation, technological development and long-term growth. Such investment can notably take the form of expenditure on education, especially tertiary and vocational training (OECD, 2017).

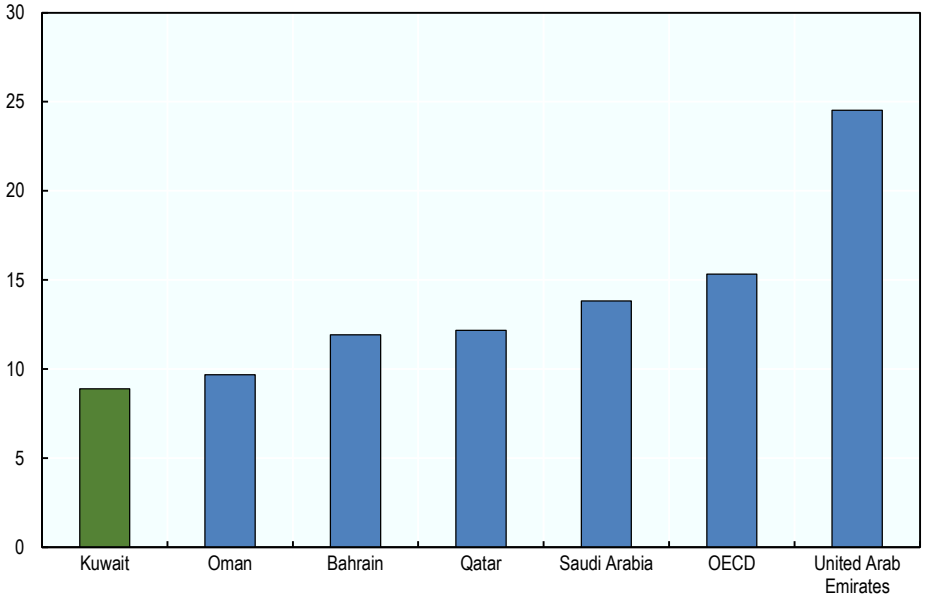
Government spending on education is relatively high in Kuwait. In the fiscal year 2015/16, Kuwait spent around KWD 2.4 billion on education (USD 7.9 billion), or around 5.5% of its GDP (KCSB, 2017). This is more than Bahrain and Qatar, where the government spent 2.3% and 2.9% respectively of their total GDP on education, according to UNESCO data. This is also more than the OECD, average which spent 4.4% of its GDP on education in 2016. In Kuwait, education affairs and services is the second-largest destination for government expenditures, just after general public services and defence (18.9% of total expenditures), and before social security and welfare affairs and services (15.6% of total expenditures).

Tertiary education is the largest item of education expenditures, with about a third of all education expenditure minus expenditure for general educational affairs. Primary education comes second (25% of all education expenditure minus general educational affairs), while secondary education lags behind with only 13% of all education expenditure (KCSB, 2017).

The pupil/teacher ratio (i.e. the number of pupils per teacher) is very low in Kuwait compared to other countries, both in primary and secondary schools, reflecting a high level of inputs in the Kuwaiti education system (Figure 2.12and Figure 2.13). In primary schools, there is one teacher for every 8.9 pupils. This is almost half the OECD average, and three times lower than in the United Arab Emirates. The picture is similar for secondary schools, with 7.6 pupils on average per teacher in Kuwait – the lowest ratio of the

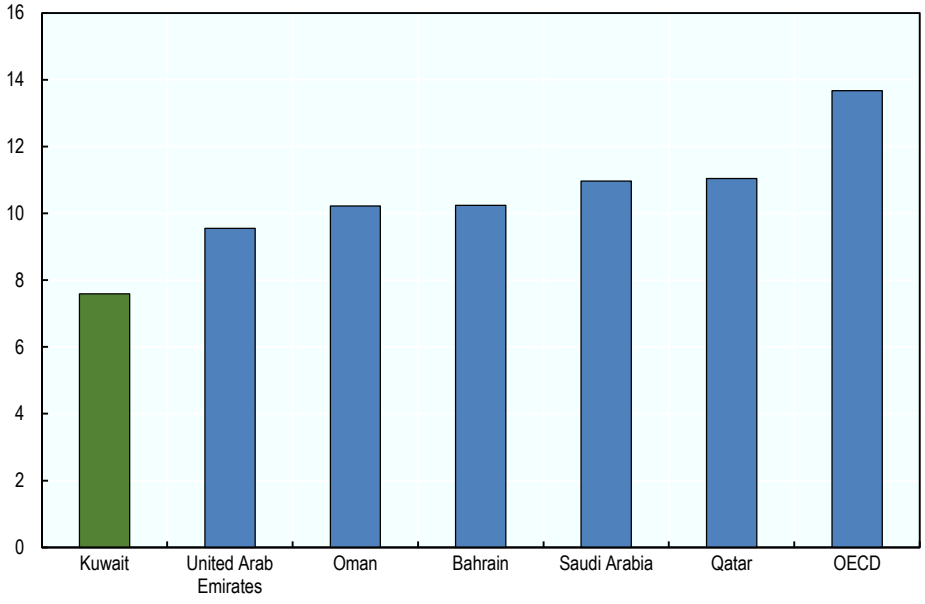
Gulf countries and almost half of the average ratio of OECD countries. In the World Economic Forum's latest *Global Competitiveness Report*, Kuwait ranks 2nd out of 141 countries in terms of average number of pupils per teacher in primary education, with only Luxembourg ranking better (Schwab, 2019).

Figure 2.12. Pupil-teacher ratio, primary education, Gulf Cooperation Council countries, 2018



Note: A low number is better, since it means fewer children per teacher.
Source: UNESCO data.

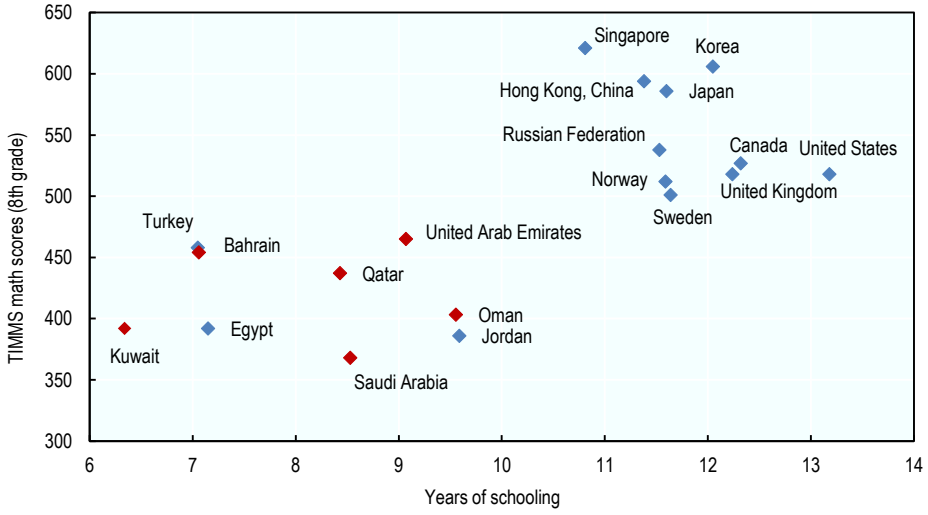
Figure 2.13. Pupil-teacher ratio, secondary education, Gulf Cooperation Council countries, 2018



Note: A low number is better, since it means fewer children per teacher.
Source: UNESCO data.

While education inputs (government expenditures, number of teachers, etc.) in Kuwait are relatively high, Kuwait does not perform as well on education outputs. Kuwait's literacy rate for people aged 15 years and older was 96.1% in 2018, according to World Bank data, which is comparable with other GCC countries, but below literacy rates in the most developed countries (99% or more). However, at around 7.2 years, the average length of schooling for people aged 25 and over is lower than in most other countries, including other Gulf countries, likely because non-Kuwaitis do not have access to the free public schools (Burney and Mohammed, 2002). Furthermore, Kuwait is one of the lowest performers in grade 8 in the Trends in International Mathematics and Science Study (TIMSS) organised by the International Association for the Evaluation of Educational Achievement (IEA) (Figure 2.14). The quality of math and science education was also assessed very poorly by Kuwait's citizens themselves according to the World Economic Forum, as Kuwait ranked 106th out of 141 countries surveyed in the *Global Competitiveness Report 2017/18* (Schwab, 2018).

Figure 2.14. Years of schooling and TIMMS math scores, eighth grade, 2015

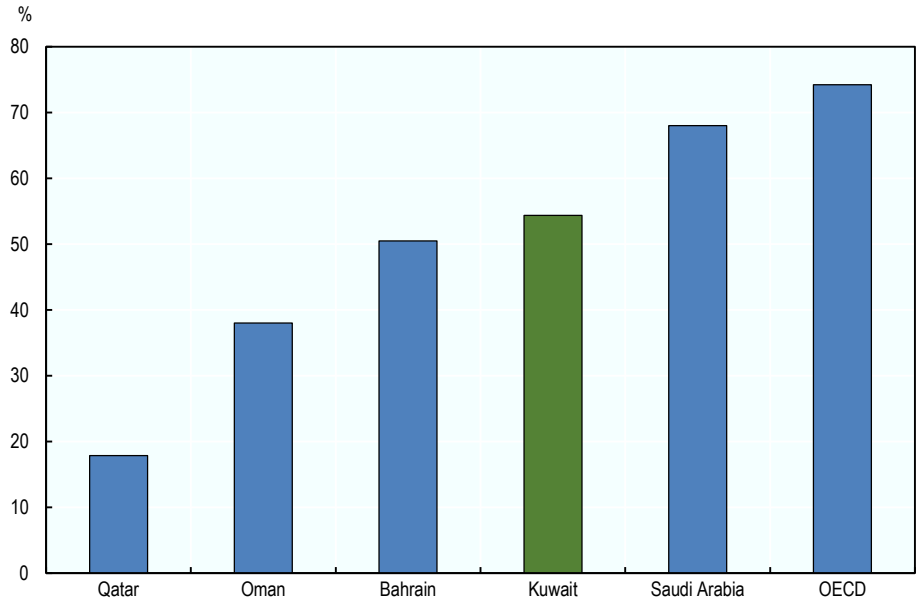


Note: Years of schooling are the average years of education completed among people aged over 15 using the Barro-Lee data set retrieved from the World Bank database, except for Oman, for which years of schooling are taken from the UNESCO Institute for Statistics database.
Sources: UNESCO; World Bank; IEA (2015), *IEA TIMMS 2015*, https://www.iea.nl/studies/iea/timss/2015/results.

Enrolment in tertiary education in Kuwait could be further improved. While enrolment rates in primary and secondary schools in Kuwait are high due to mandatory enrolment for children between the ages of 6 and 14 (in 2018, 92.4% of children were enrolled in primary education and in 2015 97.8% were enrolled in secondary education), this contrasts with enrolment in tertiary education, as only 54.4% of students were enrolled domestically in tertiary education in 2018, according to UNESCO data. This is generally higher than in other Gulf countries, but lower than in Saudi Arabia, where the gross enrolment rate in tertiary education reached 68% in 2018 (Figure 2.15), and in the OECD, where the gross average enrolment rate reached 74%.

Kuwait has one state university (Kuwait University), four higher education colleges run by the Public Authority for Applied Education and Training (PAAET) and a number of smaller private universities. In 2018, around 116 000 students were enrolled in tertiary education in Kuwait, an increase from 105 000 in 2014. Two-thirds are female students. The proportions of Kuwaiti and non-Kuwaiti students have remained stable over the years, with about 80-85% of students in Kuwait being of Kuwaiti nationality (KCSB, 2018).

Figure 2.15. Tertiary enrolment, 2018



Notes: Gross enrolment ratio is the ratio of total enrolment, regardless of age, to the population of the age group that officially corresponds to the level of tertiary education. Tertiary education, whether or not to an advanced research qualification, normally requires, as a minimum condition of admission, the successful completion of education at the secondary level.
Source: (World Bank, n.d.).

Tertiary education in Kuwait produces low numbers of scientists and engineers. At Kuwait University, for example, in 2017/18, only a low share of students graduated in sciences and life sciences (4.9%) and engineering and petroleum (12.8); the highest share of graduates was in education (24.0% of all graduates) followed by Sharia' and Islamic studies (14.9%, included in Table 2.4 under "Business, administration and law"). These shares are quite similar in magnitude and relative importance to the breakdown of graduates by field of study in other Gulf countries (Table 2.4). The supply of scientists, engineers and ICT experts is a key innovation factor because of their direct involvement in a country's technical change.

Table 2.4. Shares of graduates at Kuwait University by field of study, 2017/18

	Share (%) in Kuwait	Share (%) in other Gulf countries
Education	24.0	6.7
Arts and humanities	11.2	11.5
Social sciences, journalism and information	10.4	8.1
Business, administration and law	30.4	37.7
Natural sciences, mathematics and statistics	4.9	3.6
Information and communication technologies	..	7.3
Engineering, manufacturing and construction	12.8	15.8
Agriculture, forestry, fisheries and veterinary	..	0.2
Health and welfare	6.4	7.2
Services	..	1.3

Note: The shares of graduates by field of study in other Gulf countries are the unweighted averages of these shares for Bahrain, Oman, Qatar, Saudi Arabia and the United Arab Emirates.
Sources: KCSB (2018), *Annual Bulletin of Education Statistics 2017/2018*, https://csb.gov.kw/Pages/Statistics_en?ID=58&ParentCatID=70; UNESCO Institute for Statistics.

Around 3 100 Kuwaitis had scholarships (registered, admitted and ongoing) to study abroad in 2017/18, according to KCSB (scholarships to study abroad are only open to Kuwaiti students), which is about 3.2% of all Kuwaiti students and about 14% of all students studying outside of Kuwait (around 22 900 in 2017 according to UNESCO Institute for Statistics). This is a decrease from previous years (there were around 3 500 students with scholarships abroad in 2016/17 and 3 900 in 2013/14). Contrary to statistics on general student enrolment in Kuwaiti universities which are dominated by female students, male students are much more likely to have a scholarship to study abroad. In 2017/18, 2 301 male students had scholarships to study abroad (around 75% of Kuwaiti students with scholarships), while only 811 female students did (25%). United States and United Kingdom universities are the two top destinations for Kuwaiti students, welcoming respectively 50% and 35% of Kuwaiti students abroad.

Kuwait's universities rank very poorly in international rankings. In particular, none of its universities rank among the top 1 000 universities of the Shanghai ranking (ShanghaiRanking Consultancy, 2019), and the only Kuwaiti university which appears in the Times Higher Education (THE) 2020 ranking is Kuwait University, which ranks 801-1 000. Universities in other Gulf countries perform better than Kuwaiti universities. For example, Saudi Arabia's King Abdulaziz University ranks 101-150 in the Shanghai ranking and 201-250 in THE, while Alfaisal University ranks 251-300 in THE. In the United Arab Emirates, the United Arab Emirates University ranks 301-350 and Khalifa University 351-400 in THE, while Qatar University ranks 401-500 (Times Higher Education, 2020).

The country's long-term development plan, described in Kuwait Vision 2035, places a strong emphasis on education as a catalyst to economic diversification, sustainable growth and social progress. Human capital is one of the seven pillars of the Kuwait National Development Plan, which aims to reform the education system to better prepare youth to become competitive and productive members of the workforce. The human capital pillar consists of several projects, including the Integrated Education Reform Program project which aims to align curriculum with international best standards (for a total budget of around KWD 182 million, or USD 600 million).

R&D personnel

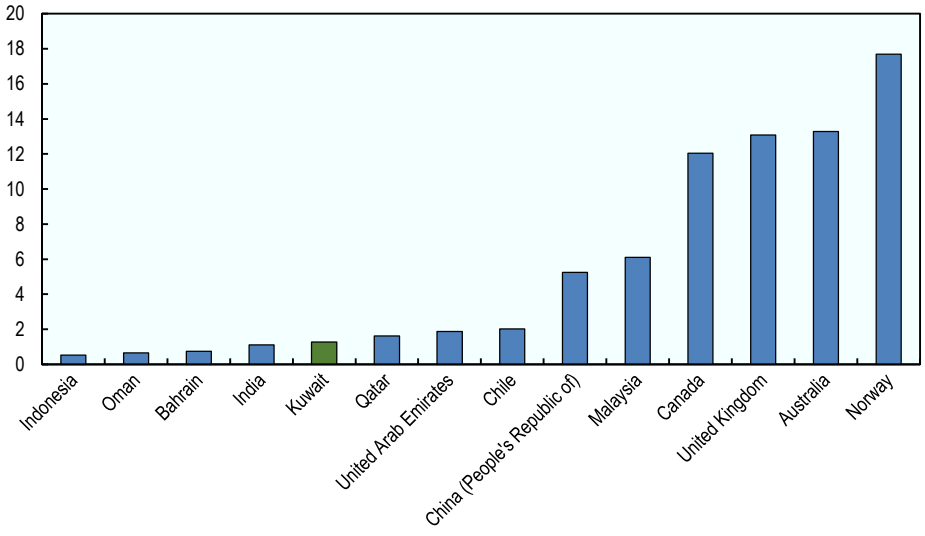
Researchers and other R&D personnel are a crucial input for innovation and R&D performance in a country and include researchers, technicians with high levels of technical experience and training, and other supporting staff who contribute directly to carrying out R&D projects and activities in R&D-performing statistical units (OECD, 2015a). According to UNESCO data, the labour force involved in research activities

has grown strongly in Kuwait over the past 10-15 years, with around 3 000 full-time equivalent (FTE) R&D workers in Kuwait. This number increased from around 300 or less FTE R&D workers per million inhabitants between 2008 and 2012 to about 700 in 2017 and from around 0.5 FTE R&D workers per 1 000 workers before 2010 to 1.3 in 2017. Shares of R&D personnel by function have remained rather constant over the past few years, with researchers accounting for about two-thirds of total R&D personnel (in FTE), technicians for less than 10% and other supporting staff for about 25%. Compared with other countries for which data are available, Kuwait is among the countries with the lowest number of FTE R&D personnel per thousand employees. According to UNESCO data, only a few countries, like Indonesia, Oman and Bahrain, have fewer R&D personnel than Kuwait. But Kuwait lies well below others like Qatar and the United Arab Emirates and has ten times fewer R&D personnel than the likes of Australia, Canada and the United Kingdom (Figure 2.16).

However, these numbers for R&D personnel need to be taken with caution as they do not systematically take into account R&D personnel in the private sector. This is the case in particular for Kuwait. However, businesses in Kuwait which took part in the business survey mentioned above reported a total of just under 1 100 FTE R&D workers. This adds to the 3 000 FTE R&D workers in government and higher education taken from the UNESCO Institute of Statistics database, making a total of around 4 100 FTE R&D workers overall in Kuwait.

Figure 2.16. Total R&D personnel per thousand total employment, 2017 or latest available year

Full-time equivalent



Source: UNESCO Institute for Statistics.

2.3.2. Innovation outputs

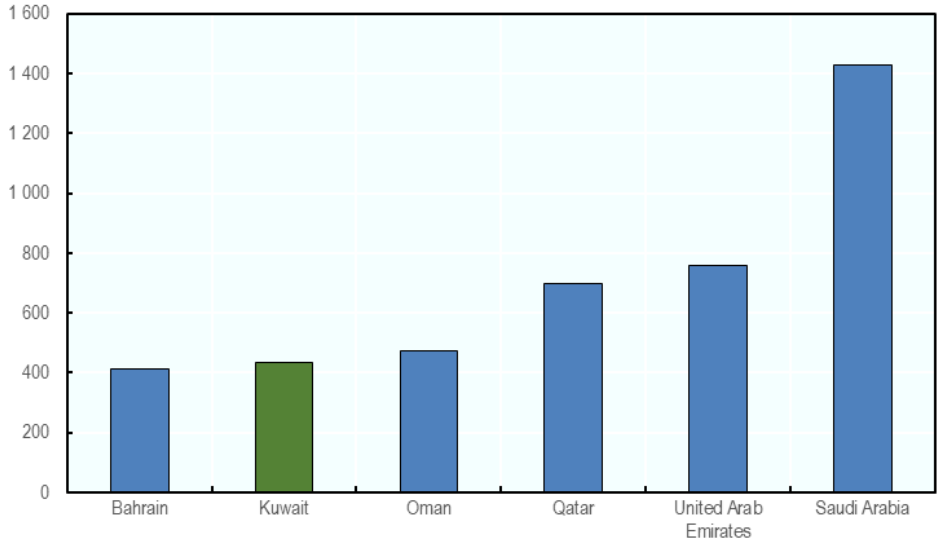
Outcomes from public research

Although the number of publications published by Kuwaiti universities or research institutes has steadily increased over the past two decades, as in almost all countries worldwide, from 633 publications in 2000 to 1 953 in 2018, Kuwait's publication output is growing at a much slower rate than the average rate of the Gulf countries, leading to a decrease in its world ranking in terms of number of publications, from 64th in 2000 to 81st in 2018. Furthermore, in terms of number of total publications per million inhabitants, Kuwait

is underperformed only by Bahrain, with Saudi Arabia publishing as much as three times more documents per million inhabitants than Kuwait (Figure 2.17).

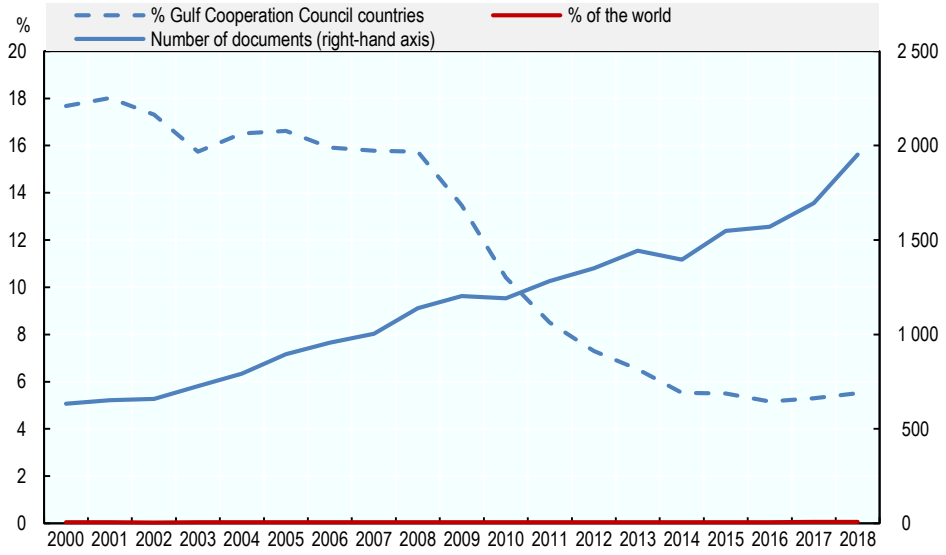
While the share of Kuwaiti publications has remained constant at around 0.05% of world publications since 1996, its share of publications in all Gulf countries has fallen sharply, from around 18% in 2000 to less than 6% in 2018, with many of its neighbours catching up and overtaking Kuwait's position in the region, and in particular Qatar, whose share increased from less than 2% to 10%, and the United Arab Emirates, whose share increased from 14% in 2000 to close to 19% in 2018 (Figure 2.18). However, these numbers need to be taken cautiously given the potential biases that such data entail. It is indeed possible that jumps in the share of publications of one country is due to a national journal entering the selection of journals of the Scopus database and in which national publications may be favoured, thereby leading to an increase in the share of this country and a drop in the share of other countries. Additionally, at least in some cases, adjunct professorships were offered to non-resident foreign researchers provided they add affiliation to the corresponding institution when publishing.

Figure 2.17. Number of total publications per million inhabitants, Gulf Cooperation Council countries, 2018



Source: OECD calculations based on Scopus data.

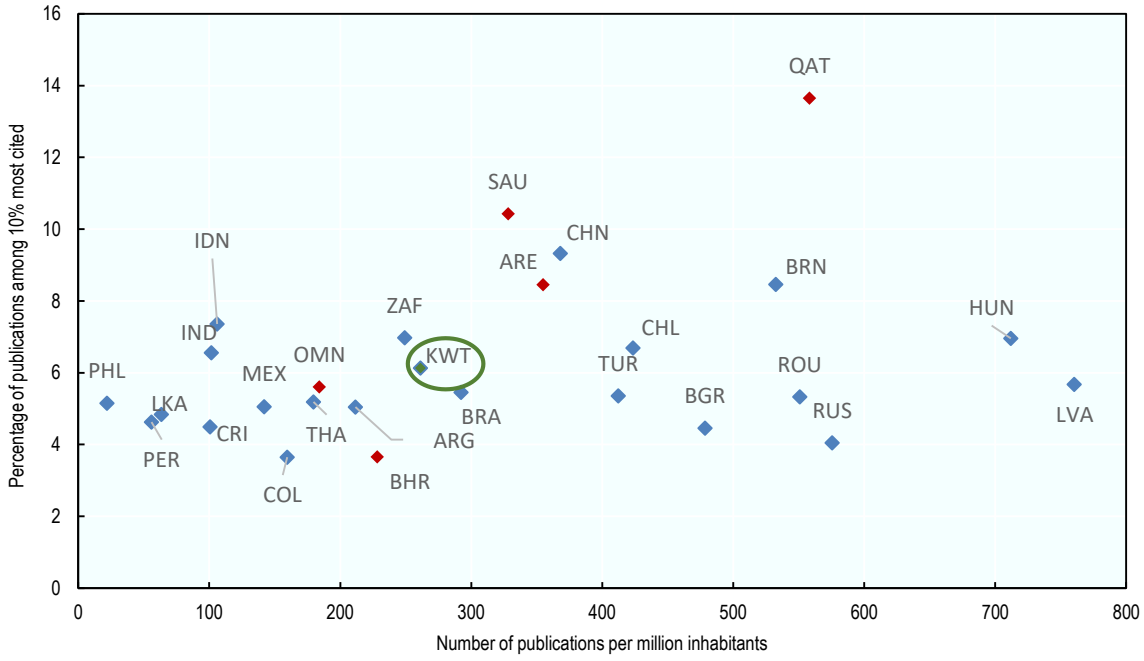
Figure 2.18. Number of Kuwaiti publications and share of Gulf Co-operation Countries, 2000-18



Source: Scimago, *Scimago Journal & Country Rank*, https://www.scimagojr.com.

Not only does Kuwait perform poorly in terms of the number of publications, but the quality of its publications is also low in a global comparison. While Kuwait performs better than Thailand, the Philippines, all Latin American countries except Chile, Bahrain and Oman, the percentage of Kuwaiti publications among the 10% most cited is lower than in all other countries. Figure 2.19 shows the number of publications per million inhabitants on the horizontal axis and the percentage of publications among the 10% most cited on the vertical axis, for a sample of countries with comparable levels of publications. It shows that Kuwait is lagging behind countries such as Saudi Arabia, Quatar or Argentina with regards to this “quality” measure of research output and research excellence

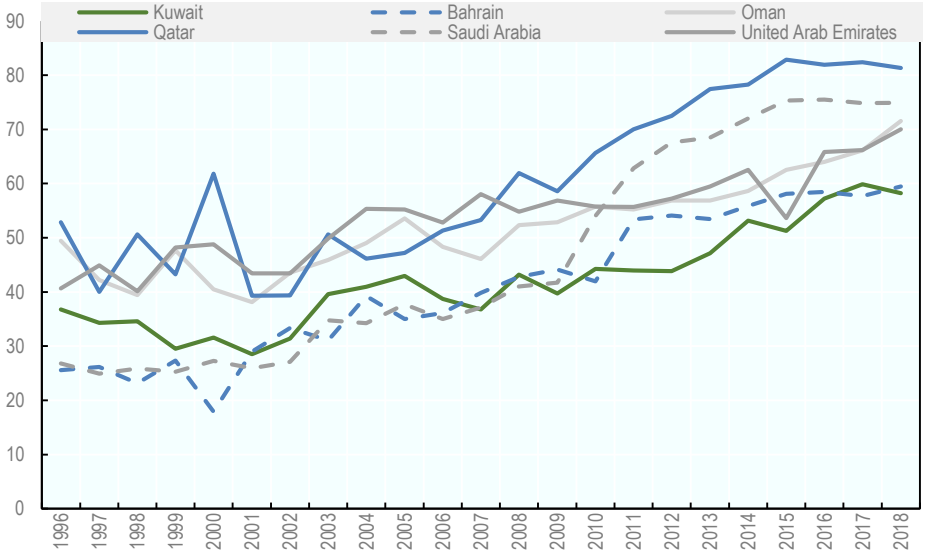
Figure 2.19. Quantity vs. quality of publications – select countries



Notes: Number of documents and percentage among the world's 10% most-cited publications, based on fractional counts of documents by authors affiliated to institutions in each economy. "Top-cited publications" are the 10% most-cited papers normalised by scientific field and type of document (articles, reviews and conference proceedings). Kuwait symbol in green, Gulf Co-operation countries in red.
Sources: OECD calculations based on Scopus Custom Data, Elsevier, Version 5.2019; 2019 Scimago Journal Rank from the Scopus journal title list (accessed June 2019).

There is room for improvement for Kuwait in terms of international collaboration on scientific research compared with other Gulf countries, where GCC neighbours have been significantly ahead since 2007, while Kuwait was above the GCC average in the late 1990s (Figure 2.20). International collaboration is defined as the document ratio whose affiliation includes more than one country address and is positively correlated with citation impact (a quality measure of scientific publishing), especially for countries with lower levels of scientific production. Encouraging international collaboration on scientific research is a means for smaller countries like Kuwait to overcome their limited scale by participating more intensively in global networks (OECD, 2017).

Figure 2.20. International collaboration on scientific research, Gulf Cooperation Council countries, 1996-2018

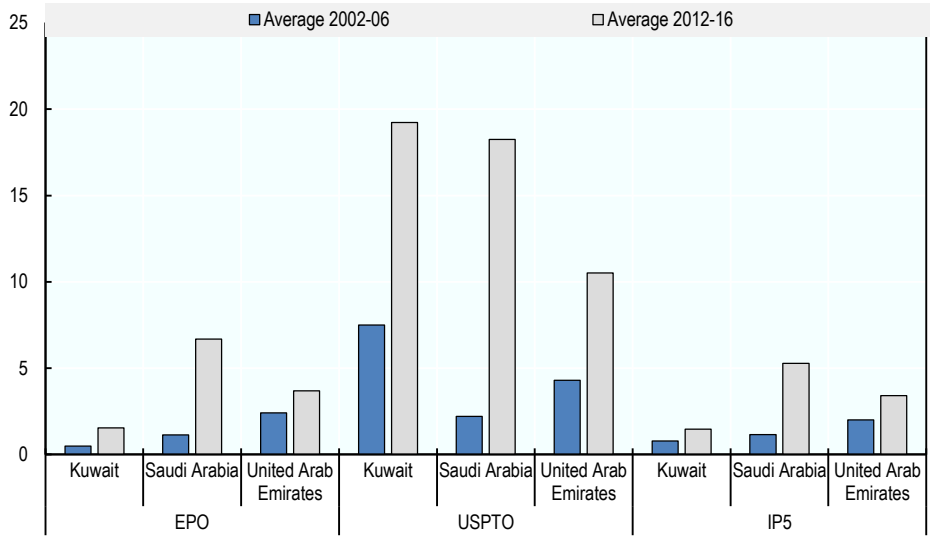


Source: Scimago.

Patents and intellectual property rights

International patenting data are used as an indicator of economically valuable technological invention and as a proxy to innovation output. Patents protect novel inventions and technologies and patent data shed light on the extent to which investment in R&D translates into innovative output. Kuwait's patent applications increased quite dramatically between 2002 and 2016, as in Saudi Arabia and the United Arab Emirates for which the OECD has data regarding patent applications. Kuwait has also filed more patent applications per million inhabitants to the US Patent and Trademark Office than Saudi Arabia and the United Arab Emirates. However, its number of applications to the European Patent Office and the number of patents filed to at least two IP offices worldwide (IP5[8] patent families) are much lower than in Saudi Arabia and the United Arab Emirates (Figure 2.21).

Figure 2.21. Patent applications filed to the EPO and USPTO and number of IP5 patent families per million inhabitants



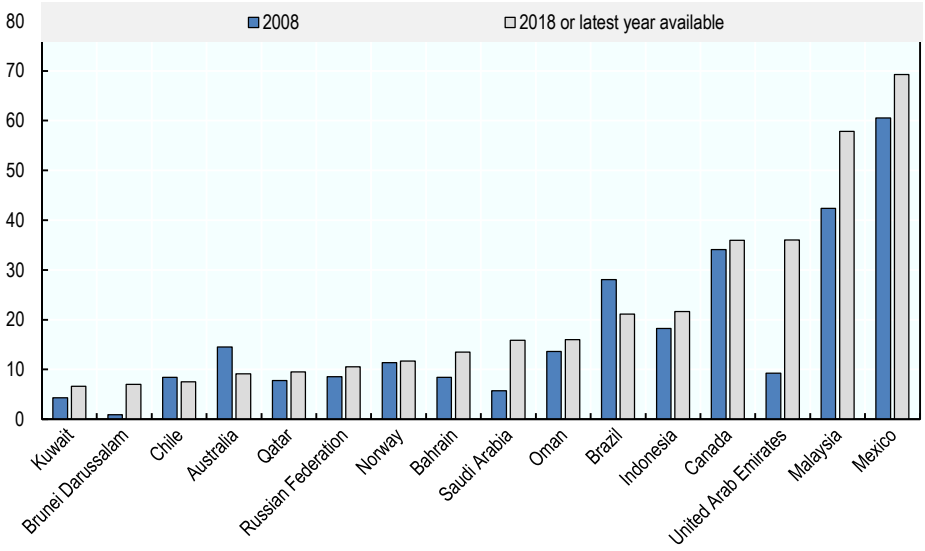
Notes: Patent applications filed to the EPO and USPTO are by priority year and inventor country. IP5 patent families refer to patents that have been filed in at least two IP offices worldwide, one of which among the Five IP offices (namely the European Patent Office, the Japan Patent Office, the Korean Intellectual Property Office, the US Patent and Trademark Office, and the State Intellectual Property Office of the People's Republic of China). The numbers of IP5 patent families are by earliest filing date and inventor country, using fractional counts.
Source: OECD, STI Micro-data Lab: Intellectual Property Database.

High R&D-intensive exports

Most developed countries have been shifting towards higher technology-intensive manufacturing industries and knowledge-intensive market services. This shift is also observed within lower technology industries, as shown in the increasing R&D intensity within these industries. The evolution towards a more knowledge-intensive economy has also been reflected in trade flows (OECD, 2007). Indicators of trade performance in R&D-intensive industries can be used as proxy measures of the industrial and economic impact of scientific and technological activity (OECD, 2019).

Kuwait performs particularly poorly in terms of share of high and medium-high R&D-intensive activities (manufacturing and non-manufacturing) in total exports and had the lowest share of all GCC countries and a sample of countries for which mining and quarrying account for at least 20% of all exports (Figure 2.22).

Figure 2.22. Share of high and medium-high R&D-intensive activities in total exports, 2008 and 2018



Notes: High R&D intensity activities are, in manufacturing: air, spacecraft and related machinery, pharmaceuticals and computer, electronic and optical products; and in non-manufacturing: scientific research and development, and software publishing. Medium-high R&D-intensive activities are, in manufacturing: weapons and ammunition, motor vehicles, trailers and semi-trailers, medical and dental instruments, machinery and equipment, chemicals and chemical products, electrical equipment, railroad, military vehicles and transport; and in non-manufacturing: IT and other information services.
Source: Calculations based on *OECD STAN database*.

2.4. Conclusion

Since 1938 and the discovery of oil, Kuwait has seen its economic and social development become increasingly dependent on the extraction and exports of this commodity. Thanks to the oil rent, Kuwait has been able to ensure a high level of wealth and well-being for its population.

However, strong dependence on a single export commodity which drives most of government revenues can also create economic vulnerability due to exposure to price shocks. The recent fall in oil prices caused a fiscal deficit in 2015/16 – the first in 16 years. Other factors such as slowing global demand amid global concerns about carbon emissions and the development of renewable energy and sustainable mobility are likely to cause a stagnating, or even decreasing, demand for oil.

These prospects require Kuwait's leadership to accelerate the transition from a resource-based economy towards a knowledge-based one, where value creation, societal challenges and the well-being of society at large will be based on the production, diffusion and implementation of knowledge.

Diversification of the economy has long been on the government's political agenda and "New Kuwait" aims at transforming the country into a finance and trading hub, transitioning towards a knowledge-based economy by 2035. Nevertheless, little has so far been achieved towards the objective of reducing dependence on oil; Kuwait's exports are as concentrated today as they were in 1995.

Oil dependence and the prevailing social contract in Kuwait are closely intertwined, as the government not only provides security, infrastructure, education and health care, but also offers well-paid jobs to its citizens financed through oil revenues. This gives Kuwaiti nationals very few incentives to engage in risky activities such as innovation and entrepreneurship or even to work in the private sector at all.

The New Kuwait Development Plan foresees a significant shift towards the private sector, mainly because the rising public wage bill is not sustainable in the long term. However, as long as the oil rent continues flowing, it will be difficult to cut back on what Kuwaitis see as their acquired rights.

One way out of this bind would be the separation of the "entitlement to the rent" from employment in a government entity (public administration or state-owned enterprise). To some extent, this is already in place with the "workforce support" supplement to Kuwaitis working in the private sector, but such support seems to be insufficient to incentivise widespread applications to private sector jobs. For entrepreneurs, the situation is even less favourable, and there is little incentive to forego risk-free employment in the government sector in order to start a business.

In parallel, a strong signal is needed from Kuwaiti leadership which could be interpreted as a moral encouragement in favour of entrepreneurship. The recent initiative of the Amiri Diwan[9] to establish a National Innovation Centre could play a decisive role in this sense, since it may be an indication to the population that innovation is a priority, and will be valued by the supreme leadership of the country.

Unleashing the innovative spirit of non-Kuwaitis by providing equal opportunities is also key. Non-Kuwaitis represent about three-quarters of the resident population, and many of them are second- or third-generation residents, yet they do not have the same rights and opportunities as Kuwaitis. Entrepreneurship rules should put non-Kuwaitis on equal footing with Kuwaitis. A non-Kuwaiti entrepreneur should be given the possibility to start a company without a Kuwaiti sponsor and to access financial support on equal terms with Kuwaitis (e.g. from the National Fund).

The importance of framework conditions for innovation has increased in recent years, especially as businesses and capital have become more mobile and seek the most favourable operating environments internationally. In particular, a business environment favourable to starting and doing business is an important pre-condition for boosting innovation. A stable financial system is also crucial to ensure investment in innovation. A sound regulatory framework fosters the generation of new technologies and helps their rapid diffusion. An appropriate education system also is necessary to provide the skills required by an innovative workforce. And importantly, innovation requires technological prowess and a culture of experimentation and risk-taking.

Kuwait has recently improved it position in global rankings of its innovation system and framework conditions, but there is still room for improvement. In its latest Doing Business Report, the World Bank ranks Kuwait 83rd out of 190 countries, a significant improvement from 97th the year before, but still below all other GCC countries. Likewise, in the World Economic Forum's Global Competitiveness Report 2019, Kuwait performs significantly below its GCC peers in almost all dimensions of the index.

It is particularly difficult in Kuwait to start a business – and more so than in other GCC countries. While Kuwait has recently implemented a number of reforms – in particular, it eliminated the paid-in minimum capital requirement, merged procedures to obtain a commercial license and streamlined online company registration – more needs to be done to make the process of starting a business easier, by tackling, in particular, inefficient government bureaucracy, restrictive labour regulations, corruption and poor work ethic in the national labour force.

Innovation performance has been modest, as suggested by the falling trend in total factor productivity growth over the past 40 years. Publication statistics, as well as numbers of patent applications and the share of high and medium-high R&D-intensive products in total Kuwaiti exports also reveal poor innovation performance.

Research and development expenditures in Kuwait amount to around 0.33-0.37%[10] of GDP – a fifth of the 2% target set in the Blue Ribbon report 12 years ago and only half of the spending in neighbouring United Arab Emirates and Saudi Arabia. A gradual increase in R&D funding can be achieved pending appropriate governance arrangements proposed in other recommendations (regarding notably the overall STI strategy, an increase of competitive research grants, performance-based contracts). In line with Kuwait's aspiration

for a knowledge-based development path and practices of other resource-rich countries (Norway, Kazakhstan), a mechanism could be set to dedicate some of the resources from oil directly to a central "Knowledge Fund" dedicated to finance higher education institutes' and research institutions' research performance contracts, as well as other channels supporting research and innovation

References

Alsharif, N., S. Bhattacharyya and M. Intartaglia (2017), "Economic diversification in resource rich countries: History, state of knowledge and research agenda", *Resources Policy*, Vol. 52, pp. 154-164, http://dx.doi.org/10.1016/J.RESOURPOL.2017.02.007.

Beidas-Strom, S., T. Rasmussen and D. Robinson (2011), *Gulf Cooperation Council Countries (GCC): Enhancing Outcomes in an Uncertain Global Economy*, International Monetary Fund, Washington, DC, http://dx.doi.org/10.5089/9781484383315.087.

Burney, N. and O. Mohammed (2002), "The efficiency of the public education system in Kuwait", *The Social Science Journal*, Vol. 39/2, pp. 277-286, https://doi.org/10.1016/S0362-3319(02)00168-4.

Callen, T. et al. (2014), "Economic diversification in the GCC: The past, the present, and the future", *IMF Staff Discussion Note*, No. SDN/14/12, International Monetary Fund, Washington, DC, https://www.imf.org/external/pubs/ft/sdn/2014/sdn1412.pdf.

Cherif, R. and F. Hasanov (2014), "Soaring of the Gulf falcons: Diversification in the GCC oil exporters in seven propositions", *IMF Working Papers*, No. WP/14/177, International Monetary Fund, Washington, DC, https://www.imf.org/external/pubs/ft/wp/2014/wp14177.pdf.

General Secretariat of the Supreme Council for Planning and Development (n.d.), *New Kuwait*, http://www.newkuwait.gov.kw/home.aspx.6

Herb, M. (2009), "A nation of bureaucrats: Political participation and economic diversification in Kuwait and the United Arab Emirates", *International Journal of Middle East Studies*, Vol. 41/3, pp. 375-395, https://www.jstor.org/stable/40389253.

Hertog, S. (2013), "Rent distribution, labour markets and development in high rent countries", *LSE Kuwait Programme Paper Series*, No. 40, http://eprints.lse.ac.uk/67381/1/Hertog_rent_distribution.pdf (accessed on 5 April 2019).

IEA (2015), *IEA TIMMS 2015*, International Association for the Evaluation of Educational Achievement, Amsterdam, https://www.iea.nl/studies/iea/timss/2015/results.

IMF (2019), *Kuwait: Staff Report for the 2019 Article IV Consultation*, International Monetary Fund, Washington, DC, https://www.imf.org/~/media/Files/Publications/CR/2019/1KWTEA2019001.ashx.

IMF (2018), "Kuwait: Selected issues", *IMF Country Report No. 18/22*, International Monetary Fund, Washington, DC, https://www.imf.org/en/Publications/CR/Issues/2018/01/29/Kuwait-Selected-Issues-45593.

IMF (2016), *Economic Diversification in Oil-Exporting Arab Countries*, International Monetary Fund, Washington, DC, https://www.imf.org/external/np/pp/eng/2016/042916.pdf.

IMF (various), *Kuwait Article IV Consultation Reports*, International Monetary Fund, Washington, DC.

Jaumotte, F. and N. Pain (2005), "Innovation in the business sector", *OECD Economics Department Working Papers*, No. 459, OECD Publishing, Paris, https://doi.org/10.1787/688727757285.

KCSB (2018), *Annual Bulletin of Education Statistics 2017/2018*, Kuwait Central Statistical Bureau, Kuwait City, https://csb.gov.kw/Pages/Statistics_en?ID=58&ParentCatID=70.

KCSB (2017), *Government Finance Statistics 2011/12-2015/16*, Kuwait Central Statistical Bureau, Kuwait City.

KCSB (2015), *Labour Force Survey 2015*, Kuwait Central Statistics Bureau, Kuwait City, https://www.csb.gov.kw/Pages/Statistics_en?ID=64&ParentCatID=1.

KISR, UNDP and GSSCPD (2019), *Kuwait Energy Outlook: Sustaining Prosperity Through Strategic Energy Management*, Kuwait Institute for Scientific Research; United Nations Development Programme; and General Secretariat of the Supreme Council for Planning and Development, https://www.undp.org/content/dam/rbas/doc/Energy%20and%20Environment/KEO_report_English.pdf.

OECD (2019), *Main Science and Technology Indicators, Volume 2019 Issue 1*, OECD Publishing, Paris, https://doi.org/10.1787/g2g9fb0e-en.

OECD (2017), *OECD Science, Technology and Industry Scoreboard 2017: The Digital Transformation*, OECD Publishing, Paris, https://doi.org/10.1787/9789264268821-en.

OECD (2015), *Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development*, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264239012-en.

OECD (2015b), *The Innovation Imperative: Contributing to Productivity, Growth and Well-Being*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264239814-en.

OECD (2010a), *SMEs, Entrepreneurship and Innovation*, OECD Publishing, Paris, https://doi.org/10.1787/9789264080355-en.

OECD (2010b), *The OECD Innovation Strategy: Getting a Head Start on Tomorrow*, OECD Publishing, Paris, https://doi.org/10.1787/9789264083479-en.

OECD (2007), *Staying Competitive in the Global Economy: Moving Up the Value Chain*, OECD Publishing, Paris, https://doi.org/10.1787/9789264034259-en.

OECD/Eurostat (2018), *Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation, 4th Edition*, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris/Eurostat, Luxembourg, https://dx.doi.org/10.1787/9789264304604-en.

OPEC (2019), *Annual Statistical Bulletin 2019*, Organization of the Petroleum Exporting Countries, Vienna, https://asb.opec.org.

Salih, A. (2010), "Localizing the private sector workforce in the Gulf Cooperation Council Countries: A study of Kuwait", *International Journal of Public Administration*, Vol. 33/4, pp. 169-181, http://dx.doi.org/10.1080/01900690903304183.

Schwab, K. (ed.) (2019), *The Global Competitiveness Report 2019*, World Economic Forum, Geneva, http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf.

Schwab, K. (ed.) (2018), *The Global Competitiveness Report 2018*, World Economic Forum, Geneva, http://www3.weforum.org/docs/GCR2018/05FullReport/TheGlobalCompetitivenessReport2018.pdf.

Shanghai Ranking Consultancy (2019), *Academic Ranking of World Universities 2019*, Shanghai Ranking Consultancy, http://www.shanghairanking.com.

SWFI (2019), *Top 100 Largest Fund Rankings by Total Assets*, Sovereign Wealth Fund Institute, https://www.swfinstitute.org/fund-rankings.

The Conference Board (n.d.), *Total Economy Database™ - Data*, The Conference Board, https://www.conference-board.org/data/economydatabase/index.cfm?id=27762 (accessed on 14 January 2020).

The Economist (1977), "The Dutch Disease", *The Economist*, pp. 82-83.

Times Higher Education (2020), *World University Rankings 2020*, THE World Universities Insights Limited, London, https://www.timeshighereducation.com/world-university-rankings.

UNCTAD (2019), *Beyond 20/20 WDS - Documentation*, https://unctadstat.unctad.org/wds (accessed on 30 October 2019).

UNDP (2019), *Human Development Index*, United Nations Development Programme, http://hdr.undp.org/en/content/human-development-index-hdi.

UNDP (2018b), *Briefing Note for Countries on the 2018 Statistical Update: Kuwait*, United Nations Development Programme, http://hdr.undp.org/sites/default/files/Country-Profiles/KWT.pdf.

United Nations (2019), *World Population Prospects 2019*, United Nations.

World Bank (2019), *Doing Business 2020*, World Bank Group, Washington, DC, https://www.doingbusiness.org/en/reports/global-reports/doing-business-2020.

World Bank (2018), "Summaries of Doing Business Reforms in 2017/18", in *Doing Business 2019*, World Bank Group, Washington, DC, https://www.doingbusiness.org/content/dam/doingBusiness/media/Annual-Reports/English/DB19-Chapters/DB2019-Reform-Summaries.pdf.

World Bank (n.d. a), *World Development Indicators*, https://databank.worldbank.org/reports.aspx?source=2&series=NY.GDP.MKTP.KD.ZG&country=.

World Bank (n.d. b), *World Integrated Trade Solutions: Trade indicators*, https://wits.worldbank.org/wits/wits/witshelp/Content/Utilities/e1.trade_indicators.htm.

Notes

[1] Total factor productivity is defined as the ratio of aggregate output (e.g. GDP) to aggregate inputs. Since economic output is a function of inputs such as labour and capital, an increase in TFP can be interpreted as the contribution of knowledge to economic output.

[2] The RCA index of country I for product j is: $RCA_{ij} = (x_{ij}/X_{it}) / (x_{wj}/X_{wt})$, where x_{ij} and x_{wj} are the values of country i's exports and of world exports to country j and where X_{it} and X_{wt} are country i's total export and total world exports respectively. An index of less than unity implies that the country has a revealed comparative disadvantage in the product. If the index is more than 1, the country is said to have a revealed comparative advantage in the product (World Bank, n.d. b).

[3] This coincides with the sale of Zain African operations in 2010 and it would appear that at least part of this drop can be attributed to this event, since Zain used to provide maintenance services to its African operations from Kuwait.

[4] The concentration index, also named the Herfindahl-Hirschmann Index (Product HHI), is a measure of the degree of product concentration. The normalised HHI is used in order to obtain values between 0 and 1: $H_j = \frac{\sqrt{\sum_{i=1}^{n}(\frac{x_{ij}}{X_j})^2} - \sqrt{\frac{1}{n}}}{1-\sqrt{\frac{1}{n}}}$ where H_j= country or country group index, x_{ij}= value of export for country j and product I, $X_j = \sum_{i=1}^{n} x_{ij}$ and n = number of products (SITC Revision 3 at 3-digit group level). An index value closer to 1 indicates a country's exports are highly concentrated on a few products. On the contrary, values closer to 0 reflect exports that are homogeneously distributed among a series of products.

[5] https://tahseen.kdipa.gov.kw/.

[6] Information included in the MRDP 2020-25 provided by the SCPD.

[7] Official statistics for R&D expenditure do not exist. Preliminary figure obtained by consolidation of data from Kuwaiti sources. Includes a very preliminary figure from KNPC, which is awaiting confirmation/revision

[8] IP5 designates the five major IP offices, including the European Patent Office, Japan Patent Office, Korean Intellectual Property office, the National Intellectual Property Administration of the People's Republic of China and the United States Patent and Trademark Office

[9] Court of the Amir.

[10] Official statistics for R&D expenditure do not exist. Preliminary figure obtained by consolidation of data from Kuwaiti sources. Includes a very preliminary figure from KNPC, which is awaiting confirmation/revision.

3 Science, Technology and Innovation Governance

This chapter presents the structure and mechanisms of governance of the STI system in Kuwait. Following a short summary of some general principles regarding effective STI governance structures, this Chapter presents a general overview of the Kuwaiti political and policy systems and discusses successively the three main levels of an STI governance structure: STI strategy and coordination; STI policy formulation and funding; and STI policy implementation.

In any country, the political system, the structure of government and the way governance is exercised affect how science, technology and innovation (STI) policy is made, implemented and, as a result, its performance.

3.1. Main characteristics of effective science, technology and innovation governance structures

Governance is key to the way all organisations work, whether they be ministries, schools, companies or universities. Governance refers to the set of largely publicly defined institutional arrangements, incentive structures, rules, etc., that determine how the various public and private actors engaged in socio-economic development interact in allocating and managing resources devoted to different policy fields. Governance therefore focuses on the interactions between the various actors that together determine priorities, strategies, activities and outcomes. Governance is as much on the processes of strategy and policy formulation and implementation, as on the content. Although there is no one best way to govern STI and good practices stemming from OECD countries cannot all be directly adapted to Gulf countries, some general principles can be used as a reference framework.[1]

Strategic orientation: Originating from the highest level of the governance structure, most OECD countries (33 of 35 OECD countries recently surveyed) have clear mid- to long-term STI strategies (Borowiecki and Paunov, 2018). These strategic frameworks are essential to provide consistency and directionality in a national system of innovation. Two key parameters of these national STI strategies are their scope and objectives:

- Scope: These national, overarching, strategic frameworks should not be fragmented or focused on a single component of the system; for example, only considering research without taking into account the demand-side and framework conditions for innovation. Such linear approaches have revealed an inability to cope with current complex and rapidly evolving STI issues.
- Directions: These strategies should provide clear objectives and ensure a wide consensus around them. These orientations guide higher education, research and/or innovation activities so that they contribute effectively to the type of economic and social development the country seeks. The broad directions set in these strategies are often supported by quantified targets, such as the overall level of R&D spending, business expenditure on R&D, the number of PhD graduates, the number of highly cited research publications, patents, researchers and others. National STI strategies also often include thematic priorities such as sector, technological areas or, increasingly, major societal challenges like ageing, health, environment, and smart transport and cities (in 30 out of 33 cases in the above-mentioned survey).

However, governance is not a simple matter of top-down “steering”, in which an all-knowing principal sets agents to work to achieve centrally generated goals. Governance involves competition, consensus-building, networking and negotiating decisions in arenas in which multiple actors are involved. It therefore entails finding a balance between having too much stakeholder consultation that can drive decision making to a halt and having too little consultation that would likely lead crucial stakeholders to resist.

In turn, these strategic orientations should be embodied in action plans with an account of the measures and financial resources that will be mobilised to reach the strategic objectives in a defined time frame and with ambitious, yet realistic, objectives, whose attainment can be described or measured in advance, so that it is clear “what success looks like”.

Strategic policy intelligence: Strategic policy intelligence is the capacity to produce and analyse the information government needs to take “good” policy decisions. It comprises statistical data, studies, and the results of policy monitoring and evaluation. Strategies and priority-setting initiatives, as well as policy formulation and implementation, need to build on evidence originating from the results of past and ongoing

activities (via monitoring, evaluation, foresight and technology assessment, etc.), trustworthy external or internal policy research, and on consultations with experts and multiple stakeholders (from implementers to various groups within civil society at large) to guarantee their buy-in. This requires sufficient resources both in terms of competences (increasingly those related to the intensive use of digital technologies and data) and funds.

Horizontal and vertical co-ordination: Since STI activities cut across many sectors and policy areas, the strategic framework should cover the policy objectives and interventions of various ministries and agencies in order to ensure their overall consistency towards common broad objectives. Specific institutions, such as high-level research and innovation councils, committees, interdepartmental platforms, and other formal or informal means of decision making and dialogue are frequently used to allow co-ordination within and across disciplinary, sectoral and policy silos, as well as across levels of government (national, regional and local).

Funding: Sufficient and predictable financial resources and appropriate incentives for good performance and accountability are necessary to support the achievement of overall goals and priorities. Mid-term predictability of resource levels is a key precondition for those planning research and innovation activities. This is especially true for research activities where long time horizons and the accumulation of knowledge often make sustained investment important to achieve real progress. International experience shows that strategies without resources commensurate with their ambitions have only limited influence.

3.2. General overview of the Kuwaiti political and innovation policy systems

3.2.1. Kuwait's political system

Kuwait's political system is an unusual mixture of absolute monarchy and democracy. Even before Kuwait City was built in the early 18th century, Kuwait was a fishing and trading nation. The Al Sabah family was the most powerful among the early settlers, and the Sheiks – i.e. the chiefs or leaders – of the family were eventually elected by the other leading families and the merchants to rule and organise the defence of the city. In 1756, Sheik Sabah Bin Jaber, who formed the Sabah dynasty, became the first Sheik to be formally established and charged with diplomacy on behalf of Kuwait (Casey, 2007). The Al Sabah family has been the royal family ever since with, especially in the early times, strong power exerted by the merchant families who generated the country's income. The exploitation of oil in the 1950s strengthened the role of the royal family, while the other early settlers and merchant families have continued to have considerable informal influence (Casey, 2007).

Following Kuwait's independence in 1961, the elite gathered in a constitutional assembly and Kuwait's Constitution was written into law by the Amir Sheikh Abdullah III Al-Salim Al-Sabah in 1962. It established the Amir as the absolute monarch who appoints the government, which has to contain at least one elected member of parliament but otherwise mainly comprises members of various branches of the Al-Sabah family and the other influential families.

The current cabinet comprises ministers with different levels of government experience. The prime minister and his four deputies (responsible respectively for defence, foreign affairs, interior and cabinet affairs) have been in government for periods of up to seven years. The other eight ministers were appointed in 2017 and the remaining minister in 2016. Since December 2017, the son of the Amir is deputy prime minister and Minister for Defence. Five members of the government are members of the royal family. In general, a position in a minister's cabinet is seen as a political reward, allowing the royal family to weigh among the leading families, the city-dwellers, Bedouin and Shias and various political affiliations.

Both Kuwaiti men and (since 2005) women aged 21 or over can vote in parliamentary elections. Parliament comprises up to 50 parliamentarians – 10 from each of the 5 districts – elected to serve 4-year terms.

Government ministers also sit as ex officio members of parliament. Kuwaiti law does not recognise political parties and parliamentarians stand as independents. In practice, however, there are five political blocs,[2] i.e. ad hoc voting alliances formed once parliamentarians are elected, which de facto function as informal political parties. Because of these five blocs and a majority of independent parliamentarians, it is hard to achieve a decisive majority in parliament, giving a potential advantage to one of the blocs formed by up to 16 members of the government (hence about one-third of members of parliament) that sit ex officio as parliamentarians and are naturally aligned with government policy (Bertelsmann Foundation, 2018).

Nonetheless, the parliament does have some distinct power. First of all, the Constitution guarantees the right for the parliament to approve or disapprove the appointment of an Amir. Also, ministers have to present annually their programmes – as well as the individual laws needed to enact them – to parliament, which can question what the government proposes. It has the right to question any minister (including the prime minister) on matters of policy. It can also dismiss a minister, based on a majority vote among the elected members of parliament.[3] Parliamentary votes of no-confidence can and have led to impeachments, resignations and even the dissolution of the cabinet.[4]

Since its reinstatement after the Iraqi invasion, parliament has become increasingly important, exercising more and more often its chief power, i.e. its power to block government proposals. In 1992, the first election after the Iraq War was won by opposition groups, which together won 31 seats with an 85% turnout. More generally speaking, the 1990s were characterised by growing parliamentary pressure for reform and greater devolution of power from the Amir to the parliament. Later, in 2011, a corruption scandal led to the resignation of the Prime Minister Sheikh Nasser al-Mohammed al-Sabah and the 2012 election produced a landslide victory for mainly tribal and Islamist factions. However, the Supreme Court overturned the election result and reinstated the 2009 pro-government parliament. The ruling family changed the electoral rules in October 2012, two months ahead of the new elections. This triggered political debates and significant protests, as it was interpreted by some as a strategy to weaken the opposition (Freedom House, 2019). As a result, many opposition groups boycotted the 2012 election, leading to a low turnout, but members friendly to the government achieved a majority (Directorate-General for External Policies, 2013). Since then, while the government bloc has just retained control, the parliament as a whole has become even more unstable and fragmented. The parliament was repeatedly dissolved in the period 2012-13, both by the Amir and the Constitutional Court. In the 2016 election, in which opposition members of parliament (in particular the Salafist bloc and the Muslim Brotherhood) took 24 of the 50 seats, smaller tribes took a greater proportion of the tribal vote so that tribal representation became fragmented.

While none of the international political system ranking or rating methods are without flaws, they all converge to describe a Kuwaiti governance system that is sometimes lagging behind that of its regional neighbours. Not only are Kuwait's indicators of governance well below the levels reached by OECD and, sometimes, Middle East and North African or other Gulf Cooperation Council (GCC) countries, but the situation seems to have stagnated or even deteriorated significantly in the past ten years. This holds true for the World Bank Governance Indicators,[5] the "Freedom in the World" aggregate score,[6] as well as the Bertelsmann Foundation Governance Index and political Transformation Index.[7] Table 3.1 and Table 3.2 provide Kuwait's scores and ranking of the Bertelsmann Foundation and Freedom in the World indices.

Table 3.1. Bertelsmann Foundation Governance Index and political Transformation Index

	Current level (2018)	Oldest level (2008)	Highest level during the period
Governance (overall index)	4.4/10	3.94/10	4.38/10 (2012)
Steering capability	4.3/10	3.7/10	4.3/10 (2010-18)
Resource efficiency	4.3/10	4.0/10	4.7/10 (2016)
Consensus-building	4.5/10	4.0/10	4.8/10 (2010 and 2012)
International co-operation	7/10	6.3/10	7.0/10 (2014 and 2018)

Political transformation (overall index)	4.5/10	4.08/10	4.95 (2012)
Stateness	7.3/10	7/10	8 (2010 and 2012)
Political participation	3.8/10	4.3/10	4.8 (2010)
Rule of law	4.5/10	4.5/10	5.3 (2012 and 2014)
Stability of democratic institutions	3.0/10	2.0/10	3.0 (2012 and 2018)
Political and social integration	4.0/10	2.7/10	4.0 (2010, 2012, 2018)

Source: Bertelsmann Foundation, (2018[74]), BTI 2018 Country Report: Kuwait, https://www.ecoi.net/en/file/local/1427395/488311_en.pdf.

Table 3.2. Freedom in the World Political Rights Index and Civil Rights Index

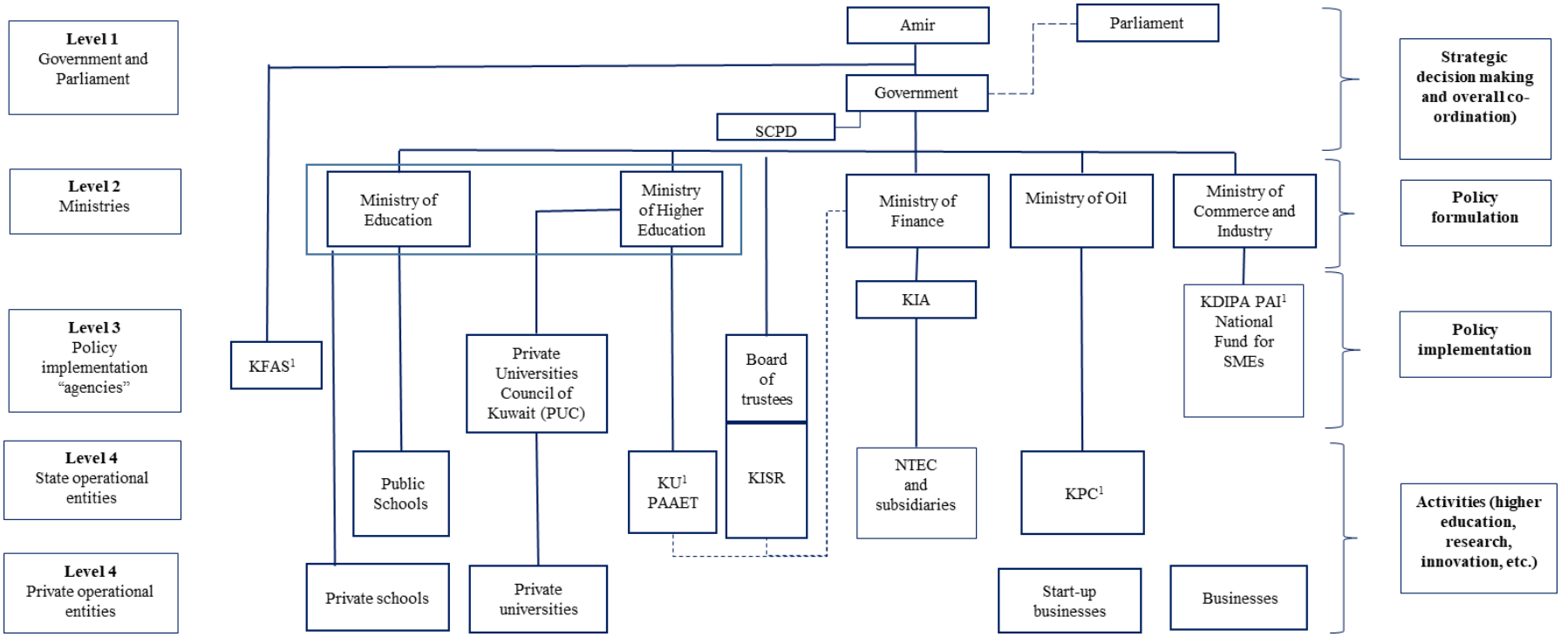
	Current level (2018)	Oldest level (2008)	Highest level during the period
Political rights (overall index)	5/10	4	5/10 (2012-18)
Electoral process	2/12	4	
Political pluralism and participation	7/16	9	
Functioning of government	4/12	6	
Civil liberties (overall index)	5/10	0	5/10 (2012-18)
Freedom of expression and belief	6/16	9	
Associational and organisational rights	4/12	6	
Rule of law	7/16	7	
Personal autonomy and individual rights	6/16	5	

Source: Freedom in the World (2019), Freedom in the World Subcategory Scores (database), https://freedomhouse.org/report/freedom-world-aggregate-and-subcategory-scores.

3.2.2. The Kuwaiti system of innovation

Figure 3.1 shows the broader set of structures through which the research and innovation system is governed in Kuwait.[8] Different categories of actors intervene at different levels and serve different primary functions, from the provision of strategic orientations at the top level (Level 1) to the implementation of higher education, research and innovation activities by public and private performers at the bottom of the system (Level 4). The influence of the top level on actual activities depends not only on the quality and relevance of the strategic process (strategic intelligence, stakeholder consultations, etc.), but also on the effectiveness of the intermediate levels that transform overarching priorities into policy (Level 2) and implement policies (Level 3).

Figure 3.1. Governance of the Kuwaiti research and innovation system



1. The governing body is chaired by a government minister, or in the case of the Kuwait Foundation for the Advancement of Sciences by the Amir.

Notes: This diagram covers major actors, but is not exhaustive. The dotted lines represent financial flows with implications in terms of governance. For instance, the Kuwait Institute for Scientific Research, Kuwait University, and the Public Authority for Applied Education and Training receive their funding directly from the Ministry of Finance, not from the Ministry of Higher Education. Given the focus of this report on research and innovation, other important parts of the national governance structure have been omitted.

This organisational chart reveals some distinct characteristics of the governance of the Kuwaiti research and innovation system. Starting from the top, there is no high-level strategic or advisory council in charge of the orientation and holistic co-ordination of the STI area and there is no dedicated ministry of research or ministry of innovation.

In 2019, the Kuwait Foundation for the Advancement of Sciences (KFAS) commissioned a consortium of consulting companies to perform a 12-month study into the "redesigning and restructuring of the government of Kuwait". The role of the government in Kuwait is described as mainly a set of loosely connected bodies providing operational services rather than an entity setting priorities, developing regulations and undertaking the monitoring of the impact of these activities (KFAS, 2019a).

3.3. Strategic orientation and overall co-ordination of science, technology and innovation

The provision of strategic orientation to guide research and innovation activities involves both top-down and bottom-up dynamics. Although the results of the deliberation on and selection of the priorities are formalised and conveyed by the highest level of policy making, it is a diffuse process that embeds the knowledge and preferences of multiple actors, from politicians and policy makers to experts and citizens.

3.3.1. The main organisations providing STI strategic directions

His Highness the Amir, the centre-of-government institutions, i.e. the prime minister and the cabinet, and the Supreme Council for Planning and Development (SCPD) are the main actors that set high-level priorities and objectives for the whole economy.

Centre-of-government institutions

In Kuwait, the highest and most "permanent" authority, in the research and innovation policy field as in all others, is His Highness the Amir. The Amir provides the vision that underpins Kuwait's long-term development. Although the Amir can be independent of the government he appoints, in particular by issuing decrees or establishing organisations (such as KFAS), most policy initiatives are taken by the cabinet, which meets in plenum for half a day per month and is chaired by the prime minister. However, the prime minister remains "first among equals" in the government – co-ordinating and leading rather than exercising a more presidential role as seen, for example, in Finland and the United Kingdom. He fulfils his constitutional mandate of policy co-ordination across the government mainly through weekly cabinet meetings.

High-level strategic and advisory bodies

In most OECD countries (Box 3.1), overarching STI priorities are set by high-level research and innovation councils or committees.[9] Although they differ in their mandate, scope, enforcement power and composition, these permanent bodies outside of ministries and agencies all have explicit mandates to engage in one or several of the following activities: provide policy advice or oversee policy evaluation; co-ordinate policy areas relative to public research; set policy priorities; and/or engage in joint policy planning regarding higher education institutions' (HEI) and public research institutes' (PRI) policies. In order to avoid conflicts of interest, funding is generally not part of the mandate of such bodies.

Box 3.1. National science, technology and innovation strategies: Results of an OECD survey and of an international benchmarking

OECD database on STI governance

A new OECD policy database provides a systematic comparison of the governance of public research policy across 35 OECD countries from 2005 to 2017 (Borowiecki and Paunov, 2018).

National science, technology and innovation (STI) strategies or plans are in place in most countries (33 of 35, or 94%) and the bulk of them address and give more prominence to major societal challenges (31 of 33 countries, or 94%). Key themes include sustainable growth, health and efficient transportation systems. STI strategies and plans also define specific scientific research, technologies or economic fields of national priority (30 of 33 countries, 90%). In 29 of 33 countries (88%), STI strategies address specific subnational priorities for specific federal states or regions, reflecting for EU member states' and partner countries' Smart Specialisation strategies.

National STI strategies often include quantifiable targets in order to assess whether policies have met their objectives or not. In 25 of 30 countries (83%), national STI strategies include such quantitative targets. Fourteen out of 25 countries (or 56%) with quantitative targets list R&D spending targets. Other targets include increasing funding for doctoral students, job placements of researchers and PhDs in industry, or increased funding from participation in international programmes. In Ireland and Japan, the national STI strategy sets quantitative benchmarks for knowledge transfer between universities and industry, including raising the private funding of university research, the amount of collaborative research funds received from industry and the number of license agreements on university patents.

Strategies also generally identify specific scientific research, technologies or economic fields (30 of 33), mentioning energy and energy technologies, health and life sciences, information and communication technologies (ICT), nanotechnology and advanced materials.

As revealed in several OECD Innovation Policy Reviews, the main limitation of these strategies lies in their implementation. If not followed by concrete action plans and/or governance mechanisms to co-ordinate policy actions, national STI strategies tend to remain mere communication documents, with limited impact. Another issue concerns their multiplicity and fragmentation: some countries have several STI strategies, originating from different parts of the national system (often the ministry of research and the ministry of economy or industry), which results in confusion and conflicting signals sent to STI stakeholders.

Vinnova international benchmark of STI councils

- A benchmarking of STI councils commissioned by Vinnova identified some good practices:
- The chairing by the prime minister and the presence of ministers is generally positively associated with a council's ability to ensure co-ordination and communication between the different sectors.
- Their ability to affect innovation policy as a whole is limited when their scope is not system-wide and/or there are parallel bodies acting in their sphere.
- The policy elaboration, co-ordination and advising roles of councils must not get entangled in resource allocation or budgeting, as this might undermine their neutrality and independence and generate strong opposition from ministries.
- STI councils' decisions should be based on wide and transparent consultations, as well as thorough analyses. If possible, these analyses should not be carried out by only one ministry. Most councils have analytical resources (a secretariat and a budget for analyses).

- Councils' form and processes should be robust against changes of government by being sufficiently flexible to accommodate some change priorities while maintaining continuity of strategic intelligence and advice.
- Councils should make their mark quickly, both as "thought leaders" in policy making and through successful intervention. This also implies good communication and dissemination of reports.
- Realistic expectations should drive the design of STI councils' mandates. Councils cannot be tasked with addressing all national needs for innovation policy, i.e. provide relevant advice, oversee policy implementation, direct or guide investments, evaluate policy, encourage experimentation and learning, and mobilise stakeholders.

Sources: Borowiecki, M. and C. Paunov (2018), "How is research policy across the OECD organised?: Insights from a new policy database", https://doi.org/10.1787/235c9806-en; Schwaag Serger, S., E. Wise and E. Arnold (2015), National Research and Innovation Councils as an Instrument of Innovation Governance: Characteristics and Challenges, https://www.vinnova.se/contentassets/4da13cc174a448d1a3f0b816c6b74366/va_15_07t.pdf.

Debates around the creation of a high-level council or committee specifically in charge of the strategic orientation and overall co-ordination of research and innovation have been going on for more than a decade in Kuwait, to no avail. The 2006 report by the Kuwait Research Review Panel (KRRP, also known as the "Blue Ribbon" panel) recommended the creation of a well-endowed and capable Kuwait Science, Technology and Innovation Council (KSTIC) (KRRP, 2007). Although it was subsequently included in the Mid-Range Development Plan 2010-2015, this recommendation was not implemented. The debate on the creation of a high-level STI Council was revived in 2016 when it was presented to the Human and Community Development Committee of the Council of Ministers. This last attempt was again unsuccessful, as the creation of a council was deemed too costly by the Ministry of Finance. The proposed council was therefore downgraded to the status of committee, a less costly (with no permanent staff), but also less powerful, policy body type in Kuwait. The Kuwait Institute for Scientific Research (KISR) delivered a new proposal for the establishment of a National Committee for Science, Technology and Innovation in 2017. Following negotiations involving several policy actors, the Ministry of Finance opposed the creation of the committee, invoking again budgetary constraints. In 2019, KFAS made a proposal to create a National Research Committee. To date, neither a council nor a committee has been appointed.

The history of the attempts to create a high-level STI body in Kuwait is presented in Box 3.2.

Box 3.2. The long and yet unsuccessful history of a national high-level science, technology and innovation body in Kuwait

The Kuwait Research Review Panel (KRRP) was the first to officially recommend the creation of a national council for science, technology and innovation in 2007. This so-called Kuwait Science, Technology and Innovation Council (KSTIC) should report to the office of the prime minister, have its own secretariat and be able to undertake studies. It was also important that it have enough political weight and influence to be able to "control allocation of resources allocated to the advancement of science, technology and innovation in the country".

The responsibilities of the proposed KSTIC were to be similar to those of a science ministry, but operating outside the government:

- creation of a detailed and common science, technology and innovation (STI) vision based in part on the panel's recommendations, but also supported by additional, more in-depth studies
- establishment on the basis of the above vision a co-ordinated strategic national R&D agenda and specific plans for its implementation
- development of plans and strategies for strengthening Kuwait's STI capacity and providing appropriate support to the institutions that can best implement these plans
- development of policies relative to some aspects of the conduct of STI in Kuwait (e.g. policies pertaining to the ownership of publicly funded research)
- development of methods for enhancing STI funding and absorptive capacity
- co-ordination as appropriate and monitoring and assessment of the work of the country's STI institutions
- implementation of a framework for promoting commercialisation activities on the part of the nation's STI institutions and in other ways facilitating the application of the products of R&D activities in industry.

The KRRP proposed an implementation process leading to the creation of the KSTIC.

The Kuwait Institute for Scientific Research (KISR) submitted an analysis of the national research and innovation system to the KRRP and recommended the creation of a policy council involving central ministers (including the prime minister), the heads of KISR, Kuwait University, the Kuwait Foundation for the Advancement of Sciences, the Public Authority for Applied Education and Training, and the Chamber of Commerce, as well as six technical specialists. This proposal did not find favour with the government.

Building upon these studies, the creation of the KSTIC was officially approved in 2010 and was included in the 2010-2015 Kuwait Mid-Range Development Plan: "Establishing a supreme council for science, technology and innovation based on the formulation of a long-term national policy and strategic planning" (SCPD, 2010). KISR also proposed a decree and several meetings were held to discuss it. However, it did not materialise, despite numerous interactions between all the concerned authorities.

This proposal reappeared in 2016, when it was presented to the Human and Community Development Committee of the Council of Ministers, this time as a "national committee for science, technology and innovation" instead of a council, in order to alleviate the financial burden. The former decree was amended and again circulated in the administration in order to agree on the terms of the revised decree. Following numerous interactions, the Ministry of Finance finally rejected the proposal in April 2018, again on the basis of financial considerations.

Sources: KRRP (2007), Report of the Kuwait Research Review Panel; Al-Awadhi, N. and Y. Al-Sultan (2007), National Policy for Science, Technology and Innovation of the State of Kuwait; KFAS (KFAS, 2019), Project: Establishment of a National Council for Science, Technology and Innovation, KFAS; (SCPD, 2010).

There are several examples of development trajectory deemed successful where a powerful government body has played an important role in providing strategic orientation and co-ordinating the various actors of their respective eco-system. This government body can be a ministry – such as the former Ministry of International Trade and Industry in Japan (Johnson, 1982) – or an advisory council, as in Malaysia, Singapore or Chinese Taipei (Box 3.3).

Box 3.3. High-level bodies in charge of science, technology and innovation strategy and overall co-ordination in Malaysia

The Investment Committee for Public Funds in Malaysia is the committee responsible for co-ordinating publicly funded research, development and commercialisation projects in the framework of the Malaysian five-year national planning process. It is composed of 15 representatives of all science, technology and innovation (STI)-related ministries as well as technical experts in STI areas.

The establishment of the Investment Committee for Public Funds aims at:

- Ensuring effective and efficient use of public funds in the planning and execution of research, development and commercialisation by fund managers at ministries and government agencies.
- Ensuring adherence to sectoral focus in line with the national priority areas and the National Science and Research Council.
- Facilitating collaboration, streamlining and minimising duplication of projects/programmes between ministries and agencies. For instance, in 2014, during the review of development projects worth MYR 1.2 billion (Malaysian Ringgit), the Investment Committee for Public Funds claimed to have streamlined 26 applications, resulting in savings of MYR 432 million, which were then allocated to other research applications.
- Disseminating information on R&D activities and schemes (i.e. manages the 1Dana database of all R&D funding opportunities).

The National Innovation Agency of Malaysia and the National Science and Research Council jointly take charge of the Secretariat of the Investment Committee for Public Funds.

The Investment Committee for Public Funds will be complemented by a Research Management Agency as recommended in the 2016 *OECD Review of Innovation Policy in Malaysia*.

Sources: OECD (2016a), OECD Reviews of Innovation Policy: Malaysia 2016, https://doi.org/10.1787/9789264255340-en; Zakri, A. (2019), "Centralised R&D agency vital to spur innovation", https://www.nst.com.my/opinion/columnists/2019/09/522169/centralised-rd-agency-vital-spur-innovation

National planning authorities

The Planning Council was the first authority created in 1962 as an independent development and planning body and mandated with developing social and economic policies and overseeing their implementation. It was replaced by the Ministry of Planning in 1976 and the Supreme Council for Planning and Development (SCPD) in 2004. The SCPD is the high-level planning authority in charge of providing overall strategic orientation and co-ordination to achieve the Amir's vision. Apart from the cabinet, it is the only instance in the governance of Kuwait that is positioned to co-ordinate strategy and policy across the Kuwaiti society.

Its mandate covers a wide range of functions, from the development and monitoring of overarching national development plans to the definition of implementation policies and the holistic promotion of the knowledge economy:[10]

- tracking the execution and implementation of the Quality Management System (QMS)'s requirements by setting up a special committee;

- considering matters of local culture and norms when conducting its own business, locally, regionally and internally; monitoring and reviewing information periodically and taking appropriate decisions;
- defining the long-, medium- and short-term strategic development directions in line with the related insights of the state;
- conducting forecasting of Kuwait's ranking on global competitiveness indicators;
- developing and monitoring the implementation of related public policies;
- promoting a knowledge economy across public institutions and providing advisory support to national development planning processes.

The SCPD has a high formal status: it is chaired by the prime minister or his delegate (currently the first deputy prime minister and Minister of Defence) and has a wide-ranging composition, with ministers coming from all policy fields related to economic development in a broad sense.[11] A number of qualified members with expertise, including representatives of the private sector and civil society organisations, also have a seat on the SCPD. A decree for their appointment is issued for a four-year term, with the possibility for renewal.

The council is also, according to available information, supported by a specific monitoring and performance evaluation committee that evaluates implementation and advises on any changes needed to the ongoing Mid-Range Development Plan (MRDP).

It has a dedicated secretariat (the General Secretariat of the Supreme Council for Planning and Development, GSSCPD) staffed with civil service members that prepare the business of the council and monitor its implementation. The GSSCPD has lacked the capacity to support the council in all its missions, which involves not only its upstream role of developing the plans and co-ordinating their execution but also, once the plan is ongoing, the monitoring of thousands of projects covering all policy fields. The GSSCPD was assessed in 2011 as "*largely understaffed, ill-equipped, undertrained and overworked*" by the Korea Development Institute (KDI, 2011). This issue was addressed in co-operation in the context of a three-year project with the United Nations Development Programme (UNDP), which has led to the strengthening of the secretariat staff and an improvement of its tools and processes (UNDP, 2011). Following this project, an institutional and capacity assessment of the GSSCPD was performed in 2015. Several issues were identified related to capacity gaps on human resource data management and workforce planning, as well as other needs on staff skills/qualifications audit, management training and staff well-being. Against this backdrop, a new project was launched in order to develop the capacities of the GSSCPD and key government agencies (including notably the Central Statistical Bureau) in the development and planning, co-ordination and monitoring of the MRDP 2015-20 (UNDP, 2015). Another UNDP project saw to the establishment of a new centre under the GSSCPD to strengthen its analytical capacity (the Kuwait Public Policy Centre [KPPC], see Section 2.3.3). The internal team at the KPPC is composed of 5 employees, strengthened by 15 international consultants through the partnership with the UNDP, mainly to develop the next MRDP which will come into force in 2020.

3.3.2. The main strategic frameworks guiding STI activities

There is no national STI strategy in Kuwait. STI priorities are included in overarching national developments, primarily in the five-year MRDPs.

Kuwait's long-term vision

In 2007, the Amir launched a long-term vision for Kuwait called "Kuwait Vision 2035", covering the period 2010-35 (GSSCPD, 2007) It sets the objective of a future Kuwait diversifying away from oil by becoming a regional financial centre and a regional trading and logistics hub and providing access to the north end of the Gulf. This vision has underpinned the overarching and mid-term strategies developed since then.

> *Main statement of the Amir's Vision 2035:*
>
> *[To] transform Kuwait into a financial and trade centre, attractive to investors, where the private sector leads the economy, creating competition and promoting production efficiency, under the umbrella of enabling government institutions, which accentuates values, safeguards social identify, and achieves human resource development as well as balanced development, providing adequate infrastructure, advanced legislation and an inspiring business environment.*

While this is not uncommon in the region, Kuwait was among the first Gulf countries to set such a longer term and overarching vision to serve as the foundation of national strategies and plans: the United Arab Emirates launched its vision in 2010 (UAE Vision 2021), Qatar in 2008 (National Vision 2030) and Saudi Arabia in 2016 (Saudi Vision 2030).[12]

A series of external studies before and after the launch of the Amir's vision largely built on the main strategic thrust of the "Kuwait Vision 2035".

McKinsey's report *Kuwait 2020* (McKinsey & Company, 2007) revolved around two overall goals:

1. Kuwait will become a niche regional financial centre focused on wealth management and capital markets. This will be supported by a strong world-class domestic financial sector that serves the financial needs of its population and attracts leading regional and international players.
2. Kuwait will also become the leading regional hub for northbound trade flows while at the same time ensuring the trade needs of Kuwait itself. Kuwait will excel in providing a large and growing number of national and international logistics companies with top-notch infrastructure, a supportive regulatory environment and a qualified workforce.

To achieve these objectives, the report proposed several initiatives to improve framework conditions for the overall economy (e.g. reduce red tape, make land available and upgrade the education system) and to strengthen the two newly prioritised sectors: financial and trade and logistics.

The report Vision Kuwait 2035 commissioned by Tony Blair's newly established consultancy mirrored McKinsey's approach in recommending the same two "pillars" of finance and trade.[13]

These reports appear to have influenced the first post-2000 MRDP which covered 2010/11-2014/15 (SCPD, 2009). It included initiatives to strengthen financial services and logistics, alongside other parts of the non-oil economy.

The SCPD also carried out a study to derive strategic objectives from the Amir's vision "*to serve as a platform for future development plans*" (SCPD, 2010). This study was based on interviews with high-level Kuwaiti decision makers (ministers, deputy ministers, members of parliament, representatives of non-governmental organisations, etc.). It revealed strong endorsement of the overall goal to transform Kuwait into a financial and commercial hub, with some variations on the scope of the "hub" (e.g. whether it should also include services). Six main strategic goals to realise the vision were identified:

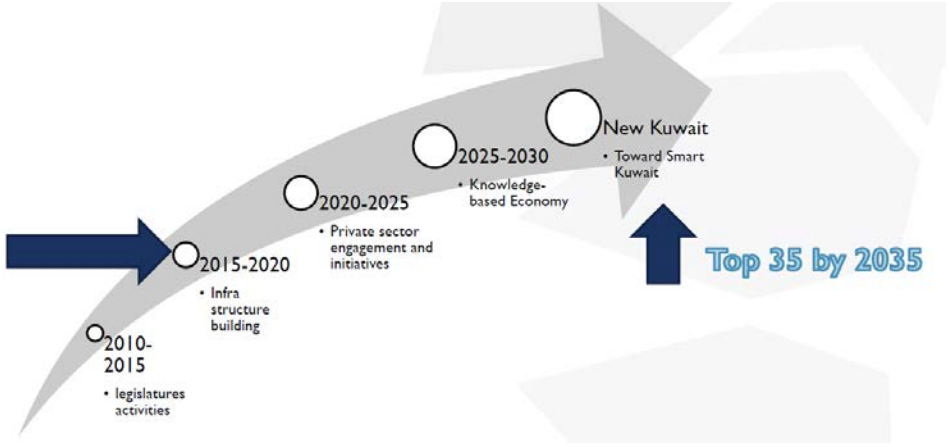
1. high growth and diversified gross domestic product (GDP)
2. a strong private sector leading the economy
3. supportive government for the private sector
4. increased job and human development opportunities for Kuwaitis
5. strong governments
6. humane society and good governance.

Under these goals, 49 strategic objectives were identified. Although some are indirectly related to research and innovation (such as "Improve the competitiveness of the private sector"), none of them explicitly relate to or mention these policy areas.

The New Kuwait Plan

Since 2010, the New Kuwait Plan serves as a long-term plan to guide strategies and policies towards the achievement of the Amir's vision. It is implemented through the MRDPs, which are designed as the five year strategic frameworks to achieve the New Kuwait Plan's objectives for 2035 and follow a gradualist approach: the 2015-20 plan is dedicated to the development of infrastructure and building, followed by five-year plans focused on private sector engagement and initiatives (2020-25) and, finally, on the support to the development of a knowledge economy (2025-30) (Figure 3.2).

Figure 3.2. Roadmap for achieving the Vision 2035 via the successive mid-range plans



Source: (Mahdi, 2018).

The New Kuwait Plan is organised around five strategic directions and seven strategic pillars (areas of focus for investment and improvement). Each pillar has a number of strategic programmes and projects (see Table 3.3). Most research and innovation-related projects are included in Pillar 2 "Sustainable Diversified Economy".

The objectives of the New Kuwait Development Plan are provided in Table 3.3. Those objectives also relate to the KDIPA mandate, in particular as pertaining to foreign direct investment.

Table 3.3. Objectives of the New Kuwait Development Plan, overall and by strategic pillar

Strategic pillars (% of total budget)	Objectives	Overall short- to medium-term objectives
Pillar 1: Public administration (0.2%)	Reform administrative and bureaucratic practices to reinforce transparency, accountability and efficiency in the government.	Position Kuwait as a global hub for the petrochemical industry. Increase direct foreign investment by 300% and attract more than KWD 400 million to information technology, services and renewable energy in the short to medium term. Develop the country's tourism sector to generate additional revenue streams and create a new job market. Continue investment in infrastructure projects, and further develop the country's transportation and power sectors by building on the recent success in independent water and power project and public-private partnership projects. Build on the recent momentum in urban development and housing with the introduction of a new master plan, developments and cities. Introduce social and economic empowerment programmes and care targeting youth, women, small and medium-sized enterprises, and the elderly. Build on the country's globally leading humanitarian record regionally and globally.
Pillar 2: Economy (44.4%)	Develop a prosperous and diversified economy to reduce the country's dependency on oil export revenues.	
Pillar 3: Infrastructure (20.4%)	Develop and modernise the national infrastructure to improve the quality of life for all citizens.	
Pillar 4: Living environment (14.5%)	Ensure the availability of living accommodation through environmentally sound resources and tactics.	
Pillar 5: Healthcare (8.1%)	Improve service quality and develop national capabilities in the public healthcare system at a reasonable cost.	
Pillar 6: Human capital (12.3%)	Reform the education system to better prepare youth to become competitive and productive members of the workforce.	
Pillar 7: Global position (0.1%)	Enhance Kuwait's regional and global presence in spheres such as diplomacy, trade, culture and philanthropy.	

Notes: Budget figures are based on the project data presented on the New Kuwait Plan website as of 13 February 2019. These figures are evolving as projects are completed and new projects are initiated. It should therefore be considered as a snapshot of the project portfolio in March 2019.
Source: New Kuwait Plan website: www.newkuwait.gov.kw.

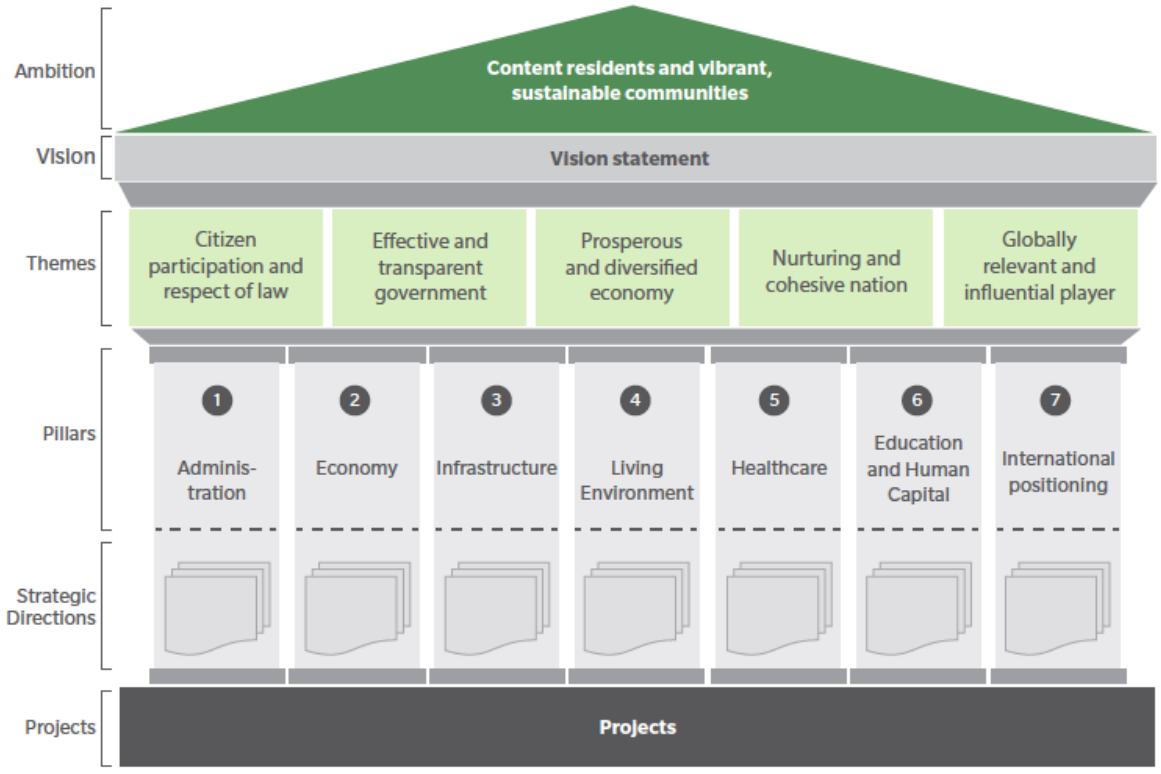
The New Kuwait Plan also includes a common monitoring framework to assess the progress towards the achievement of the objectives.

The five-year national development plans

While the SCPD's predecessors had led national strategic planning since the late 1960s,[14] the Iraqi invasion put a halt to development planning after the third plan, which covered the period 1985/86-1989/90. Following a two-year transitional plan (1992/93-1994/95), the cycle of five-year development plans was reactivated starting from the 1995/96-1999/2000 plan. The Mid-Range Development Plan covering 2010/11-2014/15 was the first plan embedded in the New Kuwait 2035 Vision.

The current MRDP covers the period 2015/16-2019/20. Like the previous one, it starts from the Vision 2035's overall objective and translates into five themes and seven "pillars" (Figure 3.3). The five themes are meant to be used as "*guiding ambitions for all development plans at an entity level and the seven pillars (…) as means to arrive at the mid-term and long-term targets*" (SCPD, 2015).

Figure 3.3. Themes and pillars of the Mid-Range Development Plan 2015/16-2019/20



Source: SCPD (2015), Kuwait Mid-Range Development Plan, 2015/2016-2019/2020.

The new MRDP 2020-25 revolves around 8 objectives: closely aligned with the New Kuwait Plan pillars:[15]

1. Unlock the Northern hub potential
2. Foster a dynamic private sector
3. Equip the people with the skills and incentives for future growth
4. Develop a transparent and synergistic government
5. Build a connected and integrated infrastructure
6. Build a liveable and harmonious environment
7. Improve our health and well-being
8. Contribute to the global community

The design of the MRDPs mixes a bottom-up and top-down policy approach. The strategic orientation, co-ordination and monitoring framework is provided by a central, high level entity, while the concrete projects to implement these orientations are proposed by the entities (such as ministries) in charge of the different policy fields.

Progress is monitored via 20 specially constructed indices, each using as sub-indicators Kuwait's performance in a number of published rankings and indices. Responsibility for each project is allocated to a specific organisation and legislative changes needed to implement the plan are identified.

In practice, the MRDP serves as a strategic framework, embedding relevant projects implemented by different ministerial entities. These entities are invited each year to submit projects to the SCPD, which

co-ordinates a multi-stage selection process lasting about seven months and involving various committees (notably the SCPD Evaluation Committee, the Supreme Council Committee and the Council of Ministers), the Ministry of Finance as well as the parliament, which approves the budget. Once selected, the projects are officially part of the MRDP and, as such, are monitored continuously by the GSSCPD, using key performance indicators. The results of this monitoring are made available on the New Kuwait dedicated electronic platform.[16]

Some of them, considered as being of higher importance to the realisation of the overall mission, are followed by a Vision Realisation Committee, which is tasked proactively to support projects on the basis of needs.

The national development projects under the MRDPs are funded and implemented by the respective responsible ministries. There is no central SCPD budget that directly funds initiatives, nor any dedicated multi-year MRDP budget. The main incentive for ministries to go through this process is therefore to have their projects acknowledged as priorities, easing negotiation with the Ministry of Finance, which allocates funding to individual ministries. In parallel, ministries also launch other projects which are deemed less relevant to the current strategic plan.

Kuwait's national development plans and the knowledge economy

None of the MRDP includes research and/or innovation as one of the pillars or main objectives. The latest MRDP 2020-2025 gathers most of the relevant objective under the theme 2 'Foster a dynamic private sector', which encompasses the objectives 'Create an integrated ecosystem for technology, innovation, and knowledge', 'Expand the private sector's role in SME incubation, funding and upscaling' and Develop new priority sectors for the economy. It is too early to analyse the projects that will be initiated under these objectives. Such analysis can only be performed on the basis of the two last plans, covering the periods 2010/11-2014/15 and 2015/16-2019/20.

The 2010/11-2014/15 MRDP (SCPD, 2009) included some projects directly relevant to research and innovation activities (Box 3.4), including an increase of R&D expenditures (up to 1% of GDP, starting from an estimated baseline of 0.2% in 2007-08), the creation of excellence centres and support to the development of KFAS and KISR. The legislative requirements of the plan also included an ordinance for establishing a high-level STI body, the Supreme Council for Science, Technology and Innovation. As can be seen from the categorisation of these initiatives, none of them relates directly to supporting innovation activities, such as measures to support the upgrade of innovation capabilities in business companies.

Box 3.4. Research and innovation-related initiatives in the Kuwait Mid-Range Development Plan 2010/11-2014/15

The third goal of the Mid-Range Development Plan related to human and social development included the objective of supporting research activities that contribute to all "development sectors". Several initiatives were planned to achieve this objective:

Strategy and funding

1. Establishing a Supreme Council for Science, Technology and Innovation based on the formulation of a long-term national policy and strategic planning.
2. Increasing attention to and use of scientific research as one of the pillars of social and knowledge development.
3. Increasing financial support for research and development activities in the public sector.

Support to knowledge exchange

1. Strengthening the relationship between scientific research institutions and production and services sectors in the public and private sectors.
2. Fostering recruitment and marketing of scientific research output in the production and services sectors in the public sector.
3. Promoting international scientific co-operation of national research and educational institutions, and advanced scientific research centres abroad.
4. Deepening and strengthening the dissemination of constructive scientific culture and scientific practices and the development of innovation in society.
5. Strengthening channels of co-operation and effective partnerships between research institutions.

Support to research activities

1. Establish centres of excellence for research at the state level in the areas of national development priority.
2. Establish specialised units in the Kuwait Institute for Scientific Research (KISR) to support co-operation with the private sector and the production and services sectors.
3. Support the development efforts of KISR.
4. Support the development of the Kuwait Foundation for the Advancement of Sciences.
5. Develop Kuwait University's research efforts through pivotal projects.

Note: The categorisation of initiatives is from the OECD.
Source: SCPD (2009), Mid-Range Development Plan 2010/11-2014/15.

A first pool of 124 projects[17] under the current MRDP were presented in the SCPD document (SCPD, 2015). While most of these projects relate to the development of all types of infrastructure (e.g. extension of the Kuwait airport, navigation channel in ports, electricity and water production, housing land, hospitals, etc.), some projects are also directly relevant to STI (Table 3.4).

Table 3.4. Main science, technology and innovation projects conducted under the Kuwait Mid-Range Development Plan 2015/16-2019/20

Project label and owner	Project's main objectives
Sabah Al-Salem university project, Kuwait University	Increase the capacity of educational facilities at Kuwait University through building six environmentally, socially and economically sustainable colleges.
Promotion and development of infrastructure for scientific research at Kuwait University, Kuwait University	Increase the budget for scientific research and development in education and research institutions in both the public and private sectors.
Determine the work of disciplines offered by private universities and colleges' market needs, General Secretariat of the Council of Private Universities	Match disciplines offered by private universities with labour market needs to raise the attractiveness of private university graduates.
Support research and development activity in private universities, General Secretariat of the Council of Private Universities	Organise domestic scholarships in private universities.
Establishment and operation of power generation plants (Abdaliyah), Kuwait Authority for Partnership Projects	Establish a new integrated solar combined cycle – support to the shift to renewable solar energy.
Establishment of the Petroleum Research Centre, Kuwait Petroleum Corporation	Develop the capacities and expertise needed to implement scientific research programmes.
Support co-operation between the research and development, production and service sectors of the private sector and state institutions, Kuwait Institute for Scientific Research	Develop an effective mechanism to link scientific research outputs with development priorities.
Technological Centre for Intellectual Property, Ministry of Commerce and Industry	Ensure the proper use and protection of intellectual property by increasing the number of intellectual property controls and inspection campaigns.
Design and construction of the power plant from renewable sources facilities (with a capacity of 75-100 MW), Kuwait Institute for Scientific Research	Increase sustainable electricity production.
Study and evaluation of the implementation of a pilot specialised research station to develop advanced technology for water desalination and renewable energy, Kuwait Institute for Scientific Research	Support the co-operation of scientific research institutions locally, regionally and globally.

Source: SCPD (2015), Kuwait Mid-Range Development Plan 2015/16-2019/20.

The set of projects presented in the initial document were ongoing or soon to be launched at the time of the drafting the MRDP. The list of projects evolves each year following the completion of former projects and the addition of those selected as part of the annual process managed by the GSSCPD (see supra). For instance, 164 projects were featured in the annual plan for 2017/18.

The New Kuwait website provides a platform to monitor the pool of projects currently being implemented as part of the ongoing MRDP. Based on these data, the OECD was able to estimate the effort put into STI initiatives in 2019: 11% of the KWD 27 billion (EUR 79 billion) budgeted for projects currently implemented under the seven pillars relate to projects supporting STI activities in a broad sense (accounting for about EUR 9 billion).[18] While the pillar aiming to establish a sustainable diversified economy currently accounts for over 44% of the total budget (Table 3.5), the formal "knowledge economy" programme (a sub-set of projects) represents only 0.2% of the total budget and 0.5% of this pillar.

The six projects under the "knowledge economy" programme are presented in Table 3.5. Most of these multi-year projects relate to the construction of new applied research centres in key areas (agriculture, marine, urban development) within KISR.

Table 3.5. Ongoing projects under the "knowledge economy" programme under the New Kuwait Development Plan

Name of the project (total cost)	Project objectives
Research and development centres for the private sector (KWD 48.5 million)	Develop and support knowledge management capacities for employment in the private sector. Improve the private sector's technological capabilities to strengthen its role in economic development and in achieving Kuwait's Vision. Set up nine specialised research units to support scientific research activities at the institute.
Establishment of specialised marine management research facilities and resources (KWD 6.3 million)	Monitor variables of marine and coastal environment, forecast impacts and find solutions. Develop integrated management systems of the marine and coastal environment and optimum utilisation of its resources. Build and equip one building and research laboratories on an area of 3 000 square metres and increase the area of mooring dock. Increase economic return of the fisheries; protect biodiversity and a healthy marine environment.
Construction of specialised integrated and advanced agricultural systems projects to promote sustainable agricultural production (KWD 1.3 million)	Increase the productivity of the agriculture sector. Provide technological infrastructure to support sustainable agricultural production. Establish four specialised agro-system facilities, including an integrated modular field agricultural research station.
Design and construction project of specialised desert development research facilities and urban development (KWD 6.3 million)	Develop techniques and systems for the development and management of desert resources. Construction of a building and facilities for botanicals research on a 4 000 m² area. Provide an infrastructure to support sustainable development programmes. Set up a single specialised R&D unit for desert development and urban development to include one R&D building (area of 1 000 m²) and field facilities for desert wildlife development (area of 100 000 m²).
Design and construction project of special-purpose facilities for the development and testing of intensive production techniques of desert seeds and plants (KWD 0.4 million)	Train national manpower on local botanical environment, out-of-natural-habitat conservation and plant production. Produce, store and supply a permanent source of original seed to support development projects and environmental remediation activities according to Kuwait's Compensation Commission programme recommendations. Establish a specialised unit to develop techniques for the multiplication of seeds and plants and support future research and development activities on plants' habitats and the conservation of biological diversity.
Sustainable Economic Farm project using latest technologies (KWD 3.5 million)	Build three protected units with 6 000 m² solar panels with a high level control of humidity, heat and lighting. Build six ponds for sustainable aquaculture purposes using 3 000 m² solar panels. Build a recycling unit using agricultural waste. Design and build a model farm for sustainable economic agricultural production using modern technologies for different types of sustainable agricultural and livestock production, and renewable and alternative energy use, treated water and integrated pests. Use of raw materials for the manufacture of fodder. Decide on specific types of agricultural production systems according to the farming items.

Source: GSSCPD (2019), *New Kuwait Online Monitoring Platform* (database), www.newkuwait.gov.kw/r6.aspx?category=6.

Of particular interest is the project to construct nine specialised research units in order to strengthen research and innovation capabilities in business companies. This project will end in 2021 and has a budget of KWD 48.5 million (about USD 160 million). This is almost unprecedented in Kuwait as there is little public-private collaborative R&D despite KISR's efforts to engage with the private sector, due to the self-reinforcing factors of a modest private sector and a lack of interest from the public administration and research community to engage with businesses. The development of an endogenous industrial innovation capacity component seems more prominent in Saudi Arabia's five-year national science, technology and innovation plans (Box 3.5).

Box 3.5. Strategic framework for science, technology and innovation in Saudi Arabia

Like Kuwait, Saudi Arabia's science, technology and innovation (STI) efforts are underpinned by the overall national objective to shift the country towards a knowledge-based economy and diversify its economy, as formalised in 2016 in the "Vision 2030" of H.E. King Salman bin Abdulaziz Al Saud. The implementation of projects to achieve Vision 2030 is planned according to mid-terms plans called the Vision realisation programmes, such as the five-year national transformation programmes. Most of the projects falling under these plans are directly financed by the Public Investment Fund, which is the Saudi sovereign wealth fund. While there is no specific Vision realisation programme dedicated to STI, Saudi Arabia has developed a dedicated national STI planning framework since 2010. It consists of five-year national science, technology, and innovation plans (NPST or Maarifah in Arabic) with different objective levels of the relative performance of the Saudi system of innovation. Following the first plan (2010-15), which aimed to establish the national STI infrastructure, the second (2015-20) and third plans (2020-25) aimed to make Saudi Arabia a leading STI country both in the Gulf region and in Asia. At the end of the fourth plan in 2030, Saudi Arabia will have become a knowledge-based economy on par with leading advanced economies. Since the establishment of Vision 2030, the second national STI plan has been restructured in order to contribute to its realisation.

The plan aims to increase R&D intensity to 2% of GDP by 2030 (it was 0.8% in 2017) and targets specific strategic areas such as water technologies, biotechnology, advanced materials, nanotechnology, information technology, electronics, communication or oil.

The development and co-ordination of the plans fall under the responsibility of King Abdulaziz City for Science and Technology and its implementation is decentralised among 17 ministries, 10 universities, and 13 national agencies and commissions. Since its launch in 2010, it has financed over 1 852 STI projects, accounting for over SAR 3.2 billion (Saudi riyal) (about EUR 0.85 billion), of which 23% went to medical research programmes and about 8% to environmental technologies.

The plan includes not only thematic programmes, for instance dedicated to strengthening STI capacity in priority areas or STI human resources, but also activities to build the national system of innovation. The first plan had notably programmes aiming at improving the legal (the STI Laws Programme, dealing for instance with intellectual property laws), institutional (the STI Organisational Structure Programme that established science and technology units in universities and research institutes) and funding (the Diversification of STI Funding Sources Programme) environment. The Diversification of STI Funding Sources Programme aimed at establishing a fund for technology development, designing self-funding policies for R&D centres and creating financial products to fund STI activities.

It is remarkable that from the start the NPST had as a prime objective to develop an endogenous industrial innovation capacity ("localisation"). This is apparent not only in the formal objectives of the plan, but also concretely in funded projects such as: The Programme of Industrial Innovation Centres; The Product Development Programme to Establish Local Suppliers; Localisation and Transfer of Mining Technology and Advanced Materials; Localisation and Transfer of Health Technology; Localisation and Transfer of Water Technology; The Programme to Raise the Manufacturing Capacity of Small and Medium-Sized Enterprises.

Sources: KACST website: https://www.kacst.edu.sa/eng/stip/Pages/AboutStip.aspx; UK Science & Innovation Network (2018), *UK Science & Innovation Network Country Snapshot: Kingdom of Saudi Arabia*, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/766269/KSA_Snapshot-Nov2018.pdf.

STI strategy

Kuwait has no research and/or innovation strategy, nor any dedicated document that would provide some direction and guidance to the STI community in Kuwait.

Given the absence of other major research performers until about 2000, KISR's strategy has become the *de facto* research strategy for Kuwait during this period. While its early focus was on (upstream) oil due to its initial funding by the Japan Oil Company, its strategy has evolved over time to match obvious national needs – oil, energy (especially electricity), water and food production via agriculture and fisheries. Environment and economic analysis were added later on.

3.3.3. STI strategic policy intelligence

Kuwait has no strongly established practice of strategic policy intelligence and lacks the knowledge infrastructure and political culture to support the policy development process. The grounding of policy decisions in evidence has therefore varied widely across ministries and over time.

However, in a non-systematic way and sometimes on their own initiative due to little buy-in from government officials, some institutions do provide strategic policy intelligence:

- Four research centres provide strategic intelligence to the SCPD: the KPPC, the National Centre for Development Research, the National Knowledge Economy Centre, and the National Observatory of Sustainable Development and Future Studies. The KPPC is expected to become the platform for the planning, monitoring and evaluation of evidence-based public policies implemented in relation to the Vision 2035. It has already provided significant inputs into the MRDP 2020-2025 (Box 3.6).
- Drawing on its continuous interactions with public and private research and innovation actors, KFAS provides inputs into the government's policy-making. It participates formally or informally in policy debates, produces concept notes and commissions studies in key macroeconomic or sectoral issues usually labelled as "special projects". This was the case, for instance, in 2017 when KFAS and the KPPC jointly commissioned a study to the London School of Economics that aimed to support reforms in health policy (LSE, 2017). This OECD Review of Innovation Policy itself, financed by KFAS, also belongs to this type of initiative. KFAS' Innovation and Enterprise Directorate also finances studies to help understand the opportunities and challenges in specific sectors, such as Fintech.
- KDIPA commissions studies and surveys that contribute to a better understanding of knowledge-based development. It for instance contracted to KISR the "Project Study on Improving Kuwait Global Competitiveness: Engine of transformation to Knowledge and Innovation-based Economy" to be completed in 2020. It included the development of a portal for analysis of Kuwait position in 10 key international indices and cross border direct flows, two innovation surveys conducted in 2016 and 2019 (supply and demand sides), Kuwait investment relations map, and a dashboard for follow up and monitoring of progress of implementation of the detailed prioritised innovation roadmap. The results of the project will be transferred to the GSSCPD to strengthen the MRDP development process.
- KISR Techno-Economics Division conducts economic studies that feed into the institute's strategy and activities, but also in policy making as part of its role in advising the government on STI matters.
- The National Advisory Services Company advises the government on technical aspects, for instance prior to making a significant or strategic procurement of a new technology (e.g. new lightning system or camera system).

Box 3.6. The contribution of the Kuwait Public Policy Centre (KPPC) to the Mid-Range Development Plan

The KPPC was established in 2016 with support from the UNDP as a specialised evidence-based policy development centre to support the development of the MRDPs, hence contributing to the achievement of Kuwait's "Vision 2035". Consultants have been allocated to each pillar of the MRDP and an elaborated workflow has been established to inform the development of the upcoming MRDP 2020-2025 across the pillars:

1. Analysis of existing policies, identification of gaps and challenges;
2. Development of research agenda and priority areas for each policy area;
3. Activation of MOUs and collaborations with international and local institutions (University of Ottawa's Centre on Governance, Issam Faris Institute at the American University of Beirut, KFAS, KU, etc.);
4. Development of white policy paper for each policy area with strategic roadmap for the sector and policy options and consultation with national stakeholders (through roundtable discussions, face-to-face interviews, surveys, focus group consultations, etc.); KPPC has produced more than 18 reports to provide GSSCPD with policy recommendations.
5. Presentation of policy recommendations to the SCPD members to be included in the MRDP.

The Centre also aims to be instrumental for monitoring the implementation of the MRDP and providing inputs into sectorial strategies. According to the SCPD, this method contrasts with the previous planning period, when the process for developing the MRDP was decentralised and hindered by communication problems between the different bodies.

The support to the MRDP development and policy implementation also benefits from a KPPC unit dedicated to applying the latest findings in behavioural science and economics into public policy (the Kuwait Policy Appraisal Lab). A customised five-year macroeconomic model was also developed to support the mid-term forecasts that serve as the economic foundations of the five year plans.

While the co-operation between the SCPD and the UNDP reinforces the national staff with international consultants located on site for several years and provides tools for supporting strategic planning, the issue of the sustainability of the KPPC was raised during interviews. Dedicated capacity building mechanisms (e.g. training workshops and on-job-training activities) are in place to transfer knowledge and skills to the 11 national staff.

Source: KPPC (2020a), Annual report, Kuwait Public Policy Centre, General Secretariat of the Supreme Council for Planning and Development; KPPC (2020b), Kuwait Public Policy Centre (KPPC) - Supporting the New Kuwait Vision 2035, Kuwait Public Policy Centre, General Secretariat of the Supreme Council for Planning and Development.

The lack of structuring of the strategic intelligence infrastructure and its loose linkages to the government means that there is generally little available information on the respective activities of these few active actors, which translates into various overlaps and inefficiencies.

The statistical basis for STI policy making is very poor. Due to the absence of any R&D or innovation survey until 2019, key indicators such as business expenditure for R&D, government expenditure on R&D (GERD) or higher education expenditure on R&D (and hence the GERD and the many indicators based on it, such as the R&D intensity) are simply missing or incomplete (and thus misleading). As previously mentioned, a first combined national R&D and Innovation Survey was undertaken in the framework of this

OECD review, under the umbrella of KFAS and the KCSB. No data on government STI-related budgets are available either.

This paucity of data on both the source and execution of financial resources in the STI area makes it difficult to monitor the efforts of the different actors over time, relate them with observed results and compare Kuwait with its peers. As shown in many developing countries – and on fewer occasions in advanced countries – the lack of an infrastructure to properly measure STI is a major obstacle to crafting effective strategies and policies. In the past, KFAS has made the case for improving the STI statistical system, but with little success so far.

The administrative databases are also very rudimentary. Partly due to the absence of a corporate tax, there is, for instance, no complete and regularly updated business company register. A reliable business register is the backbone of a comprehensive, high-quality database, which in turn is fundamental for sound evidence-based policy advice (OECD, 2010). Similarly, the fact that there is little public support to private companies results in the absence of a database of scheme beneficiaries. This is a major hurdle when it comes to conducting surveys, and prevents Kuwait from benefiting from any big data opportunities to shed light on the functioning of the national STI system and the effectiveness of policies and reforms (OECD, 2018).

Evaluation is also essential to enhance the effectiveness and efficiency of policies to foster innovation, promote growth and deliver social welfare. The evaluation culture in Kuwait is underdeveloped and only a few evaluations have been conducted in the STI area, most often commissioned by the evaluated institutions themselves, for their own purposes and agenda. Against this backdrop, KISR was evaluated in 1999, and KFAS initiated several evaluations of all or part of its programmes and affiliated institutions.

3.4. Science, technology and innovation policy formulation and funding

Based on the strategic framework provided at the top level of the system, the ministries devise the appropriate means of intervention and level of funding needed to fulfil the overall objectives in their respective policy remit. Since research and innovation are cross-cutting policy issues, this policy formulation process requires a fair amount of horizontal co-ordination among different “sectoral” ministries. In many countries, some authorities directly in charge of research and/or innovation policy issues (depending on their scope and the division of labour between them) have not only direct responsibility to deal with research and/or innovation intermediaries and implementers (universities, research and innovation centres/labs, agencies, etc.), but also act as a “catalyst” and “pilot” across policy silos. They are also advocates for research and innovation within the government.

One specific key feature of the Kuwaiti system is that there is no dedicated ministry of research and/or innovation (neither is there a state secretary/deputy minister in charge of these policy areas within another ministry).

3.4.1. Policy formulation

Kuwait has never had a clear STI policy, but given the small size of the STI system and the absence of dedicated STI policy actors, the plans and actions of a few prominent implementing institutions in different areas – Kuwait University (KU) for basic research and in particular KISR for applied research and development – have *de facto* served as policy makers in these areas. However, this situation has severe limitations.

Given that KU’s strategy is mainly generated from the bottom up, its strategic framework hardly provides the backbone of a research policy. Due to the strength of department heads *vis-à-vis* the strategic management of the university and the lack of strategic management capabilities in general, this is not

uncommon in other universities around the world. However, a growing number of them have in recent years increased their efforts to prioritise their activities and improve the profiling of their activities.

As KISR is the main research performer in Kuwait, it has not only a significant direct influence on the overall pattern of government-funded research, but also a strong social network. Almost anyone working elsewhere in the government sector in a job related to science and technology is likely to be a former KISR employee. This is neither surprising nor unusual – alumni of SINTEF (KISR's equivalent in Norway) have enjoyed a similar position in the past, though the growth of the rest of the research sector (and especially of university research) has reduced the policy influence of its network over time. Such a strong social network is useful because it provides cohesiveness, but it can also be problematic as the "mental model" of the institute risks dominating policy and producing lock-in to existing priorities. It can also lead to allocating resources to the established organisation, even when there is a need for development and capacity-building elsewhere in the research and innovation system.

In the past, KISR was formally given the task of advising government on STI policy, but this advice seems to have addressed little beyond its own internal activities. KISR has repeatedly attempted to exercise leadership in STI policy formulation. In 2007, it launched a preliminary STI policy document, anticipating that it formally would be given responsibility for STI policy (Al-Awadhi and Al-Sultan, 2007). These repeated efforts had only mixed results, not least because of the conflicts of interest of such a dual role of policy prescriber and beneficiary.

Around the same time, in 2006, His Highness the Amir tasked a high-level panel – the KRRP – with an inquiry into how the national research and innovation system should be run. The members of the panel were leading members of Kuwait's scientific class and a number of eminent foreigners. Jorma Routti, who had been head of the European Commission's Directorate-General for Research and earlier head of SITRA (the Finnish Innovation Fund) and a member of Finland's Science and Technology Policy Council (these days called the Research and Innovation Council)[19] appears to have been of particular influence.

The KRRP produced a report the following year which gave a detailed and highly critical account of the performance of Kuwait's research system (KRRP, 2007). It said Kuwait's research system lacked scientific culture, had too few resources and weak institutions, was poorly managed, and lacked sufficient international links or links with the industry. In summary, the recommendations of the KRRP were to:

- Increase public spending in R&D to 2% of GDP;
- Establish and fund a national policy and high-level governing body – the Kuwait Science, Technology, and Innovation Council (KSTIC) – to provide the leadership and co-ordination for the development and implementation of a national research agenda;
- Reform and restructure KISR to include a more focused vision and qualified and experienced leadership;
- Build Kuwait centres of excellence in technologies? which are deemed critical to Kuwait's future and include petroleum and petrochemicals, water and renewable energy focused on solar power. These centres must be strongly linked to international centres of excellence through alliances and partnerships;
- Strengthen the STI system and culture throughout Kuwait.

The panel also recommended that the KSTIC establish and implement an integrated and national STI policy, called the Kuwait Science, Technology and Innovation Policy. This policy should have included the following elements:

- significantly enhanced funding of R&D and other STI activities and the targeting of that funding to areas of greatest strategic significance to the country;
- identification and implementation of methods and strategies for increasing industry participation in STI activities and the benefits of STI investments;

- identification and implementation of methods and strategies for enhancing co-ordination of STI activities at both the national and international levels.

Neither the KSTIC nor the Kuwait Science, Technology and Innovation Policy were established, despite repeated calls (Box 3.7).

Box 3.7. Extracts from repeated calls for a dedicated innovation policy in Kuwait

The debate on the development and implementation of a dedicated innovation policy has been going on for years. There have been repeated calls for it, originating from different contexts and communities.

2003: *Formulating a national policy for science and technology would ensure the activation of their developmental role, through effective contribution of R&D institutions in providing consulting support for the state, based on the realisation of the importance of applying the proper scientific rules to achieve success of developmental plans and projects in Kuwait.* (Kuwait National Development Plan 1999-2003, cited in Al-Awadhi and Al-Sultan, 2007).

2007: *In Kuwait, the policy and decision makers, with the consonance of the legislative authority and support of different sectors of society, have attributed great efforts in establishing, supporting and reinforcing scientific and research institutions to support other activities in society; aiming to develop the society and to achieve the goals of the state's endeavours for establishing an effective modern society. Nevertheless, these activities and endeavours may not induce impacts in the ideal form, except in the presence of a declared policy of science and technology and innovation contributing in steering the gear of those institutions to contribute in the comprehensive national development, in reinforcing the cultural, socio-economic development, and in nurturing the knowledge society and human development.* (Al-Awadhi and Al-Sultan, 2007)

2007: *First and foremost, the panel's vision for the STI sector is one that is focused and aligned with the nation's greatest needs and most significant opportunities. In the panel's view, this alignment must derive from the creation of a national STI policy.* (KRRP, 2007)

2015*: It is documented in the report that many of the important elements of an innovation system are in place in Kuwait, but that the linking or connectivity between the elements of the system often seem to be too weak. To improve this requires partly the introduction of an integrated and coherent STI policy and partly the formation of a national innovation system.* (Asheim, 2015)

2018: *A broader innovation policy, in addition to the current ongoing R&D capacity development activities in key national organisations focusing on and identifying the priority innovation sectors, will be a realistic way to achieve a successful diversified specialisation.* (Al-Mahmood, 2018)

2017: *As a result of limited co-operation and co-ordination between the various components of Kuwait's STI system as well as absence of a formal process for national overall and detailed priority setting, Kuwait's STI system is still inadequately engaged in issues related to the country's main source of wealth.* (Bizri, 2018)

Sources: Bizri, O. (Bizri, 2018), Science, Technology, Innovation, and Development in the Arab Countries; Al-Awadhi, N. and Y. Al-Sultan (2007), National Policy for Science, Technology and Innovation of the State of Kuwait; Al-Mahmood, M. (2018), A Research Agenda for the Economy of Kuwait; Asheim, B.T. (2015), An Innovation Driven Economic Diversification Strategy for Kuwait, https://www.e-marmore.com/MarMore/media/Policy-Reg/An-Innovation-driven-Economic-Diversification-Strategy-for-Kuwait-Executive-Summary.pdf; KRRP (2007), Report of the Kuwait Research Review Panel.

3.4.2. STI policy funding

The main channels for allocating funds to STI activities are:

- Institutional funding provided to universities and research institutes for doing research, KISR and KU accounting for the bulk of these funds.
- KFAS supports higher education, research and innovation projects via different funding instruments and affiliated research and knowledge-transfer institutions. The bulk of this funding is allocated to KISR. Only a negligible portion of private R&D expenditures are supported by the state. To give an indication, the budget of the three programmes of KFAS' Innovation and Enterprise Directorate was KWD 2.9 million in 2017.
- Specific line ministries' projects which in their respective fields support the development and demonstration of innovative technologies and services, for instance in the area of water desalination and renewable technologies. As mentioned above, the bulk of this research is executed by KISR (and therefore accounted for in KISR's budget).

However, despite the small size of the system and the number of funding streams, properly assessing the amounts of government funding is challenging. There is no centralised or aggregated budget dedicated to STI, nor an STI budget in the different line ministries either. Neither are there robust ex post consolidated expenditure statistics in line with international norms.

As discussed in Chapter 2, the bottom-up recollection of the relevant expenditure of main R&D performing sectors points to an R&D intensity of 0.33-0.37%[20] of GDP with the following allocation by sector of performance: 0.19% by government, below 0.1% for the private sector and below 0.01% by other sectors. The main channels of government funding of this amount of expenditure are as follows

- Institutional funding provided to universities and research institutes for doing research, KISR, KU, PAEET and Dasman Diabetes Institute accounting for the bulk of these funds.
- KFAS' support for higher education, research and innovation projects in public and, to a lower extent, private institutions.
- Specific line ministries' projects within and outside the MRDP. These are very limited and for the most part are allocated to KISR.

Using the same sources of data mobilised in Chapter 2 to estimate the amount of R&D expenditures, but this time only considering the portion funded by government sources, one can estimate the amounts represented by the main channels of government funding at about KWD 96.5 million in 2017, hence accounting for about 0.27% of GDP.[21]

3.5. Science, technology and innovation policy implementation

3.5.1. The implementation of Kuwait's national development plans

The implementation of the MRDPs has encountered significant challenges, at least in recent years. Most of the initiatives planned under the 2010/11-2014/15 MRDP were not implemented or only partially implemented. As previously mentioned, the intended creation of the national STI council and the increase in the government's financial support to STI activities did not materialise. The consultants hired to monitor the implementation of the plan concluded that this was poorly implemented, not least because the required resources were often not made available (EXCPR, n.d.). The SCDP also concluded in the following MRDP (SCPD, 2015) that the implementation of the 2010/11-2014/15 MRDP had been below expectations and pointed to several difficulties:

- the link between Vision objectives and policies was not clearly defined;

- policies used were often vague or presented multiple ideas;
- key performance indicators did not exhaustively measure the plan's objectives;
- projects that were operational or not directly related to the vision were included in the plan;
- the "strategic projects" section was not based on clearly defined criteria;
- legislative requirements did not link to specific projects or goals.

The National Assembly's Financial and Economic Affairs Committee, which also reviewed in 2014 the obstacles faced in implementing the MRDP, pointed to the poor implementation of projects, partly due to policy paralysis and operational sluggishness (Asheim, 2015).

However, Bertelsmann's transparency report for Kuwait in 2014 attributed the poor performance of the MRDP to the political turmoil of the period, during which it became hard for the royal family to push its proposals through parliament. According to the report, the government became increasingly compelled to consider the interests of various groups, which hindered its ability to perform long-term prioritisation (Bertelsmann Foundation, 2015).

Beside the MRDP projects themselves, there are few projects focusing mechanisms in the system to align activities to the national development plans beyond a few channels for the implementation of national priorities in higher education and research organisations' work plans:

- KU develops and regularly updates national priorities to guide its activities, for instance, for the allocation of internal funding to research activities. These national priorities are developed by the institution itself, somewhat in a bottom-up way by the solicitation of the different parts of the university, but allegedly taking into account the overarching national priorities enshrined in the ongoing MRDP.
- KISR's five-year plans are developed on the basis of the MRDPs.
- KFAS also announces the national priorities in its call for proposal and uses them to assess the relevance of projects. It generally strives to align its activities with the broad national priorities.

The lack of interministerial co-ordination previously highlighted is also a factor hindering the implementation of the MRDPs, as it results in overlap, duplication and repetition of tasks. Several key infrastructure projects under the current MRDP have been delayed or postponed (KFAS, 2019b). The recent resignation of the government was in part related to delays in a major infrastructure project planned under the MRDP (Al Shurafa and Al Sherbini, 2019).

More generally, the implementation of STI policy is significantly hindered by the lack of government awareness, interest and capabilities relevant to STI activities. Many examples of projects delayed, misunderstood or simply rejected by government bodies were collected during interviews. The high level of bureaucracy and the lack of operational autonomy of STI actors is also a major impediment that gets in the way of policy implementation. Although it is difficult to provide hard evidence, managers of research institutions and researchers themselves were unanimous in claiming that the budgeting and auditing rules they have to comply with do not allow them to perform their activities adequately.

3.5.2. The role of STI agencies

No agency is tasked with the implementation of research and/or innovation activities in Kuwait. Some functions of both are partly addressed by different institutions, notably KFAS, but these do not cover the whole range of responsibilities usually covered.

Although their scope and status vary among countries, the term "agencies" generally refer to semi-autonomous organisations that programme, select and fund research and/or innovation activities. Many OECD and non-OECD countries have put in place such agencies and these organisations are now well-established pillars in these countries' national systems of innovation, as is the case, for instance, in

Norway or the United Kingdom (Box 3.8). Extensive literature has documented this process of "agencification", i.e. the delegation of policy implementation authority to specific government bodies in an increasing number of countries, across different policy fields. The main rationale for establishing these intermediate organisations lies in the separation of policy orientation, which remains in the hand of committees, central government and line ministries (the "principals") and the implementation of policies by agencies that maintain strong and proximity-based relationships with the universities, research institutes and private firms. The "governed autonomy" of agencies *vis-à-vis* their principals and their "embeddedness" in the network of actors that implement higher education, research and innovation activities are what distinguish agencies from other state actors:

Box 3.8. Research and innovation ministries and agencies: Results of an OECD survey and a NESTA international comparative study

Research and higher education policy bodies – OECD database on STI governance

A new OECD policy database provides a systematic comparison of the governance of public research policy across 35 OECD countries from 2005 to 2017

Almost all OECD countries have set up dedicated institutions to take charge of science, technology and innovation (STI) policies, in particular with regards to defining priorities for higher education institutions (HEIs) and public research institutes (PRIs), however with different features. National governance settings differ notably with regards to the type of institutions (council/committee, ministry, agencies), their coverage (research, knowledge transfer, business innovation), level of government (federal, national, regional) and their functions in the policy cycle (strategic orientation, co-ordination implementation, evaluation). While in 8 of 34 countries (24%), a council or committee is in charge of setting key policy priorities for HEIs' and PRIs' policy, this responsibility is in all other 26 countries (76%) within the purview of national ministries (a single one or more than one). Most commonly, the scope of these ministries covers the fields of education/higher education, research and/or innovation.

Agencies (under different names such as councils or foundations) decide on allocations of project-based funding for HEIs in 31 (or 89%) of 35 OECD countries, while in most countries, ministries provide institutional funding (32 of 35 for HEIs, 27 of 34 for PRIs), under different forms and modalities. Ten countries created agencies to allocate project-based funding between 2005 and 2016, such as the National Research Agency (ANR; created in 2006) in France, the Innovation Fund Denmark (IFD; created in 2014) or the Spanish Agency of Research (AEI; created in 2015). Ministries of Education, Research and/or Innovation continue to allocate project-based funding in Greece, Italy, Japan and New Zealand.

Funding arrangements differ. While in 12 of 31 OECD countries where agencies provide project-based funding, there is a single agency, the remaining 19 have more than one agency. These agencies are specialised in specific research fields (e.g. in Australia and Canada) or cover separately basic research, applied research and/or innovation tasks. From 2007 to 2017, several countries, including Denmark and Estonia, reduced the number of funding agencies, in some cases to simplify funding applications (creating a "one-stop shop"), to increase efficiency and in others to reduce the fragmentation of funding.

Innovation agencies – NESTA study

In 2016, the UK organisation NESTA performed a comparative study of ten different innovation agencies pertaining to different types of innovation systems. The main results are summarised below.

While research agencies have among their core functions the provision of competitive project funding following some common basic functioning rules, the variety of innovation agencies is far greater, in their structure, scope and instrument portfolio. There is no single model for a successful innovation agency (not even the hardly replicable "DARPA model"), each of them being adapted to the pursued objectives (their role) and the characteristics of the national system they are embedded in.

The study identifies the main roles of innovation agencies: the market and system fixers seek to address generic (i.e. non-sector specific) impediments to business innovation and R&D investment in markets and networks, mainly through the provision of competitive funding. Industry builders have a more transformative role, by creating and developing new opportunities for growth (new sectors/technologies). Mission drivers aim to induce innovations that tackle societal and economic challenges, often in specific sectors such as defence, health, energy and the environment.

Like their counterparts in the research policy field, innovation agencies operate with considerable autonomy in most cases. As innovation moves higher up the political agenda, they cannot be entirely separated from political processes and are influenced by – agencies shorter term and changing – political priorities. Their level of autonomy also depends of the type of agency: the "industry builders" tend to be more closely linked to the government's priorities and industrial strategies.

The functions they perform to support innovation can be categorised into four main types: 1) direct financial assistance (e.g. grants or loans, but also R&D tax credits in some cases); 2) non-financial assistance for businesses (e.g. advisory or matchmaking services); 3) support for intermediaries (e.g. incubators and accelerators); and 4) linkages and institution-building activities (e.g. knowledge-transfer programmes, clusters, networks, competence centres, etc.).

The roles performed by innovation agencies should be clear and well-delineated so that they do not pursue too many roles, which might happen as a result of over-ambitious government expectations and sometimes simply by an internal tendency of agencies to expand their prerogatives ("mission creep"). Innovation agencies should be part of different policy levers governments have to support innovation.

Given the complexity and variety of their modes of intervention, but also due to the diversity of the different shapes and forms of innovation, the assessment of the impact of innovation agencies cannot be captured relying uniquely on quantitative indicators. More qualitative assessments are also needed to grasp innovation agencies' quality of management, ability to take and learn from strategic risks, design and implementation of programmes, etc.

Sources: Borowiecki, M. and C. Paunov (2018), "How is research policy across the OECD organised?: Insights from a new policy database", https://doi.org/10.1787/235c9806-en; Glennie, A. and K. Bound (2016), How Innovation Agencies Work: International Lessons to Inspire and Inform National Strategies, https://media.nesta.org.uk/documents/how_innovation_agencies_work.pdf.

The managerial and operational autonomy of agencies is intended to generate significant efficiency gains and avoid conflicts of interest. However, although agencies operate at arm's length from their political principals, they receive most of their budgets from one or several ministries in the relevant policy fields and are accountable to them with regards to the achievement of the objectives they have set. Countries have designed different ways to mix and balance structural separation and strategic linkages between the principal(s) and the agency, depending on the context.

Past OECD Innovation Policy Reviews have shown that agencies' embeddedness in the research and innovation communities has enabled these communities to play an increasing role in policy implementation and in policy formulation and as critical "advisors" for strategic orientation. Agencies are therefore a key component of national systems' "distributed strategic intelligence", by exploiting the fact that organisations that work closely with beneficiaries have better insight into research and innovation processes than central

bureaucracies. The agencies provide monitoring and evaluation information, but often also propose new programmes and instruments, based on their closer proximity to users and problems and developments in science and technology.

3.5.3. The role of KFAS in supporting research and innovation

Beside the limited direct interventions from ministries, the main organisation performing STI policy implementation is KFAS. It was established by Amiri decree in 1976, at the request of leading Kuwaiti business figures who offered to pay 5% of their annual profits to establish a foundation for the advancement of science. This percentage fell over time to the current level of 1% of the profits of Kuwaiti share-holding companies. Foreign-owned companies are not obliged to pay. The decree calling for donations to KFAS has never been ratified by parliament, so it has the slightly uncertain status of a request from the Amir rather than being a legal requirement. Over time, companies have started to regard the 1% levy as a tax rather than a donation. As a result, resentment has grown among the companies, but appears to have lessened since 2008, when KFAS changed its leadership and began to more deliberately design a strategy that included specific efforts to support innovation in business in addition to its broader science-related tasks.

KFAS launched its first strategy in 2012, covering the period 2012-16. The key strategic thrusts (STs) were:

- contribute to the development of a strong advocacy for science, including science education, support the gifted and talented, and help advance scientific culture and the enabling environment in Kuwait (ST1);
- enhance and integrate R&D capacity in and among Kuwaiti scientific institutions to address national priorities (ST2);
- support innovation and assist in developing the required links to commercialisation within a framework for an integrated STI system (ST3);
- catalyse the strengthening of technological and innovative capacity in the private sector (ST4).

The current strategy (2017-21) merged ST3 and ST4 into a single directorate, marking a clearer separation between what KFAS does internally and what it does through its external centres and reflecting the shift of some KFAS research commercialisation activities to SAC (Box 3.9). An important role of KFAS to support research and innovation activities relates to the funding and management of four external centres: the Dasman Diabetes Institute (DDI), the Jaber Al Ahmed Centre for Molecular Imaging and Nuclear Medicine (JAC), the Scientific Centre of Kuwait (TSCK), the Sabah Al Ahmad Centre for Giftedness and Creativity (SAC). In addition, KFAS has launched in 2016 KFAS Academy, in association with KU. Originally known as the Kuwait Virtual University, it is currently in a start-up phase and has so far provided selected university-level courses – especially foundation courses – and professional development. The intention is to become an online university to provide low-cost degree teaching across the Arab-speaking world. Initial course development projects have been placed with universities abroad.[22]

Box 3.9. KFAS Strategy (2017-21)

The current KFAS Strategy encompasses the following strategic thrusts:

ST1: Scientific Culture Directorate: Advocating science, education and scientific culture

- Programme 1: Science and Math Education. Although there have been challenges in engaging the interest of the Ministry of Education in supporting the development of more innovative and attractive ways to teach STEM subjects in schools, KFAS continues to strive to enhance science

and math curricula, in cooperation with the Ministry of Education. KFAS also supports some informal educational initiatives.

- Programme 2: Engagement in Science and Technology. KFAS supports financially and technically Science, technology and innovation (STI) initiatives, as well as science competitions, seminars and trainings, and science festivals and fairs. This programme focused on enhancing the role of STI within the society, by contributing to the capacity building of local civil society organisations through events and providing funding to support capacity-building initiatives with other local entities, such as the the Gulf University for Science and Technology's Centre for Teaching, Learning and Research.
- Programme 3: Publicising and Disseminating Science and Technology. Supporting national non-governmental organisations and social media influencers in science communications. KFAS support for instance publications for children and adults that are focused on science, math, and innovation.

ST2: Research Directorate

- Programme 1: Research Grants. Providing small, principal investigator-initiated research projects typically oriented to a single investigator and support staff.
- Programme 2: Research Capacity Building, focusing on early-career funding and grants to help career development, as well as capacity building workshops, conferences, etc.
- Programme 3: Flagship Research and Technology Transfer Projects (mega R&D and technology transfer) on themes defined by KFAS in consultation with stakeholders.
- Collaborative Research Unit, supporting international collaborations in research with renowned international research and academic institutions, as well as centres of excellence, such as with the University of California, Berkeley or Paris' Sciences Po.

ST3: Innovation and Enterprise Directorate: Strengthening capacity for innovation in business and of individuals

- Programme 1: Enterprise Knowledge Enhancement. Commissioning targeted sectoral studies and sponsoring STI events to promote awareness and reduce barriers to innovation and development in the private sector.
- Programme 2: Learning and Human Development for Enterprises. Creating and funding training programmes for employees, managers and human resource personnel to increase their ability to recognise the value of STI, assimilate it and apply it to commercial ends.
- Programme 3: Enterprise Support and Transfer of Technology. Supporting the development of innovations in firms both via R&D and through technology transfer projects.
- Office of International Programs. Develops and maintains relationships with a handful of leading international universities with a view to helping Kuwaiti researchers undertake scientific visits and develop collaborative research.

Special Projects and Initiatives Office

The Special Projects Initiatives Office manages three categories of project:

- Projects that are aligned with KFAS' mission but are not part of the scope of the programmes under the strategy thrust area.
- Projects that are not aligned with KFAS' mission, but are within its broad mandate, which includes social solidarity in Kuwait.
- Other projects that are beneficial to society but are not within KFAS' broad mandate. Formerly, this category took up a large proportion of KFAS' available budget, but it has been managed

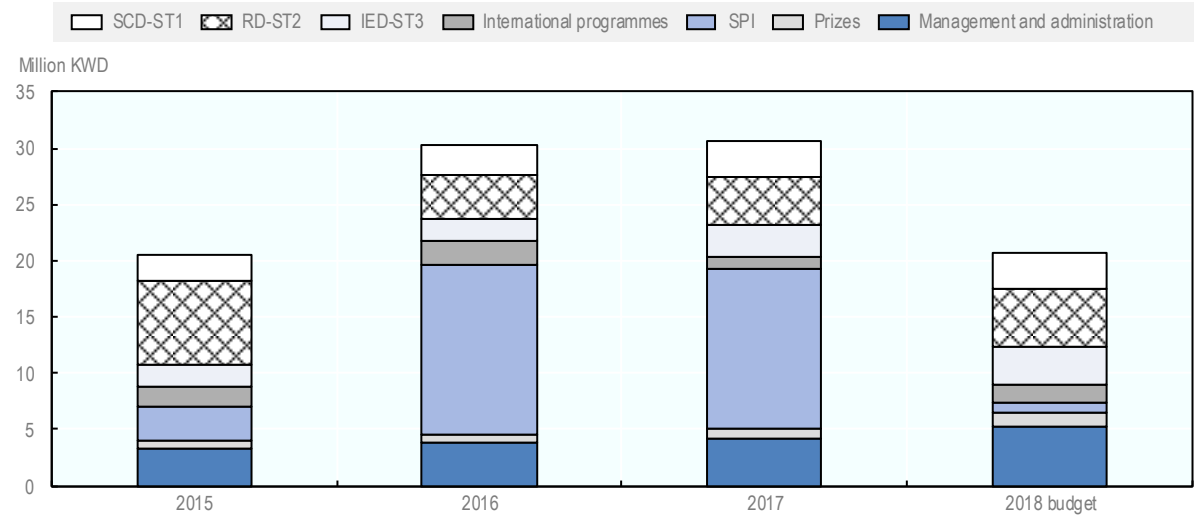
down via increased management insistence on working within the mandate as a foundation for the advancement of science.

The Prizes Office oversees competitions and awards the Kuwait Prize (for research achievement within the international Arab community), the Scientific Production Prize to reward publication by early- and mid-career researchers, the Kuwait e-Content Award for production of social media, the Al-Sumait Prize for development initiatives or scientific research promoting development in Africa. The office also administers the Al Nouri Prize for the best doctoral dissertation awarded by universities in Arab countries, on behalf of the Al-Nouri Philanthropic Trust.

Source: KFAS (2016), KFAS High-level Strategic Plan 2017-2021.

Figure 3.4 shows recent programmatic expenditures by KFAS. It shows that the funds dedicated to support research decreased significantly between 2015 and 2016 while the two other programmes (supporting respectively scientific culture and business innovation) expanded. The Special Projects and Initiatives (SPI) account for a major part of KFAS' budget and account for the bulk of its budget increase. These initiatives target Kuwait's national priorities. These projects are within KFAS' mandate, but are not a part of the scope of the existing core programmes. The list of SPI initiatives for 2015-17 reveals a very diverse set of activities, ranging from strategic studies (e.g. a study of the reform of Kuwait's administration "*compatible with the Vision of the State of Kuwait 2035*" to several small actions to fund the international mobility of students and researchers, as well as several workshops and events) (KFAS, 2018).

Figure 3.4. Breakdown of KFAS' expenditure, 2015-18, by strategic thrust



Source: Data supplied by KFAS.

KFAS' activities to support research activities (ST2) and business innovation (ST3) are analysed respectively in Chapters 3 and 4.

References

Al Shurafa, S. and R. Al Sherbini (2019), "Kuwait government resigns after parliamentary inquiry session", *Gulf News*, https://gulfnews.com/world/gulf/kuwait/kuwait-government-resigns-after-parliamentary-inquiry-session-1.1573721006144.

Al-Awadhi, N. and Y. Al-Sultan (2007), *National Policy for Science, Technology and Innovation of the State of Kuwait*, Kuwait Institute for Scientific Research, Kuwait City.

Al-Mahmood, M. (2018), *A Research Agenda for the Economy of Kuwait*, Supreme Council for Planning and Development and United Nations Development Programme.

Asheim, B. (2015), *An Innovation Driven Economic Diversification Strategy for Kuwait*, Kuwait Foundation for the Advancement of Sciences, https://www.e-marmore.com/MarMore/media/Policy-Reg/An-Innovation-driven-Economic-Diversification-Strategy-for-Kuwait-Executive-Summary.pdf.

Bertelsmann Foundation (2018), *BTI 2018 Country Report: Kuwait*, Bertelsmann Foundation, https://www.ecoi.net/en/file/local/1427395/488311_en.pdf.

Bertelsmann Foundation (2015), *BTI 2014: Kuwait Country Report*, Bertelsmann Foundation, https://www.bti-project.org/en/reports/country-reports/detail/itc/kwt/ity/2014/itr/mena.

Bizri, O. (2018), *Science, Technology, Innovation and Development in the Arab Countries*, Elsevier, https://doi.org/10.1016/C2016-0-01541-3.

Borowiecki, M. and C. Paunov (2018), "How is research policy across the OECD organised? Insights from a new policy database", *OECD Science, Technology and Industry Policy Papers*, No. 55, OECD Publishing, Paris, https://doi.org/10.1787/235c9806-en.

Casey, M. (2007), *The History of Kuwait*, Greenwood Press.

Directorate-General for External Policies (2013), *Policy Briefing: Kuwait's Political Crisis Deepens*, European Union, Brussels, https://www.europarl.europa.eu/RegData/etudes/briefing_note/join/2013/491461/EXPO-AFET_SP%282013%29491461_EN.pdf.

EXCPR (n.d.), *The Kuwait's Development Plan 2010-2014: Measurement and Evaluation*, EXCPR, http://excprco.blogspot.com/2014/03/the-kuwaits-development-plan-2010-2014.html.

Freedom House (2019), *Kuwait Country Report 2019*, Freedom House, https://freedomhouse.org/report/freedom-world/2019/kuwait.

Freedom in the World (2019), *Freedom in the World Subcategory Scores (database)*, Freedom in the World, https://freedomhouse.org/report/freedom-world-aggregate-and-subcategory-scores.

Glennie, A. and K. Bound (2016), *How Innovation Agencies Work: International Lessons to Inspire and Inform National Strategies*, Nesta, https://media.nesta.org.uk/documents/how_innovation_agencies_work.pdf.

GSSCPD (2019), *New Kuwait Online Monitoring Platform (database)*, http://www.newkuwait.gov.kw/r6.aspx?category=6.

GSSCPD (2007), *Vision of the State of Kuwait 2010-2035*, Supreme Council for Planning and Development.

Gulf News (2019), "Kuwait government resigns after parliamentary inquiry session", *Gulf News*, https://gulfnews.com/world/gulf/kuwait/kuwait-government-resigns-after-parliamentary-inquiry-session-1.1573721006144.

Johnson, C. (1982), *Miti and the Japanese Miracle: The Growth of Industrial Policy, 1925-1975*, Stanford University Press.

KDI (2011), *The Formulation and Implementation of National Development Plan in Kuwait*, Korea Development Institute, http://www.ksp.go.kr/english/pageView/info-eng/398.

KFAS (2019a), *Invitation to Propose – Research Project: Redesigning the Structure of the Government of Kuwait to Transition from an Operational Service Provision Role to that of Priority-setting, Regulation and Monitoring*, Kuwait Foundation for the Advancement of Sciences.

KFAS (2019b), *Project: Establishment of a National Council for Science, Technology and Innovation*, Kuwait Foundation for the Advancement of Sciences.

KFAS (2018), *SPI Projects 2015-2016-2017*, internal document, Kuwait Foundation for the Advancement of Sciences.

KFAS (2016), *KFAS High-level Strategic Plan 2017-2021*, Kuwait Foundation for the Advancement of Sciences.

KPPC (2020a), *Annual report*, Kuwait Public Policy Centre, General Secretariat of the Supreme Council for Planning and Development (GSSCPD).

KPPC (2020b), *Kuwait Public Policy Centre (KPPC) - Supporting the New Kuwait Vision 2035*, Kuwait Public Policy Centre, General Secretariat of the Supreme Council for Planning and Development.

KRRP (2007), *Report of the Kuwait Research Review Panel*, Kuwait Research Review Panel.

LSE (2017), *Review and Strategy Development of the Public Health System in Kuwait*, Kuwait Foundation for the Advancement of Sciences.

Mahdi, K. (2018), "Kuwait's plan for the future", Arab Open University, Kuwait.

McKinsey & Company (2007), *Kuwait 2020: Developing Kuwait into a Financial and Trade Centre*, McKinsey & Company.

OECD (2018), *OECD Science, Technology and Innovation Outlook 2018: Adapting to Technological and Societal Disruption*, OECD Publishing, Paris, https://dx.doi.org/10.1787/sti_in_outlook-2018-en.

OECD (2016), *OECD Reviews of Innovation Policy: Malaysia 2016*, OECD Reviews of Innovation Policy, OECD Publishing, Paris, https://doi.org/10.1787/9789264255340-en.

OECD (2015), *The Innovation Imperative: Contributing to Productivity, Growth and Well-Being*, OECD Publishing, Paris, https://doi.org/10.1787/9789264239814-en.

OECD (2010), *The OECD Innovation Strategy: Getting a Head Start on Tomorrow*, OECD Publishing, Paris, https://doi.org/10.1787/9789264083479-en.

Schwaag Serger, S., E. Wise and E. Arnold (2015), *National Research and Innovation Councils as an Instrument of Innovation Governance: Characteristics and Challenges*, Vinnova, https://www.vinnova.se/contentassets/4da13cc174a448d1a3f0b816c6b74366/va_15_07t.pdf.

SCPD (2015), *Kuwait Mid-Range Development Plan 2015/2016-2019/2020*, Supreme Council for Planning and Development.

SCPD (2010), *A Draft Strategic Vision for the State of Kuwait 2010-2035: An Executive Summary*, Supreme Council for Planning and Development, https://www.scpd.gov.kw/archive/The%20Vision%20of%20The%20State%20of%20Kuwait.pdf.

SCPD (2009), *Mid-Range Development Plan 2010/11-2014/15*, Supreme Council for Planning and Development.

UK Science & Innovation Network (2018), *UK Science & Innovation Network Country Snapshot: Kingdom of Saudi Arabia*, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/766269/KSA_Snapshot-Nov2018.pdf.

UNDP (2015), *Institutional Capacity Development for Implementation of the Kuwait National Development Plan (ICDI/KNDP)*, United Nations Development Programme, https://www.kw.undp.org/content/kuwait/en/home/projects/institutional-capacity-development-for-implementation-of-the-kuw.html.

UNDP (2011), *Support the Capacity Development of the General Secretariat of the Supreme Council for Planning and Development to Direct the Strategic Planning Priorities of the State of Kuwait*, United Nations Development Programme, https://www.kw.undp.org/content/kuwait/en/home/operations/projects/democratic_governance/support-the-capacity-development-of-the-general-secretariat-of-t.html.

World Bank (2019), *Worldwide Governance Indicators (database)*, World Bank, http://www.govindicators.org.

Zakri, A. (2019), "Centralised R&D agency vital to spur innovation", *New Straits Time*, https://www.nst.com.my/opinion/columnists/2019/09/522169/centralised-rd-agency-vital-spur-innovation.

Notes

[1] These principles (in this chapter and subsequent chapter) are mainly based on the OECD STI knowledge base, as synthesised in the OECD Innovation Strategy (OECD, 2010) and *The Innovation Imperative* (OECD, 2015) and on the results of more than 30 OECD Reviews of Innovation Policy (https://www.oecd.org/sti/inno/oecd-reviews-of-innovation-policy.htm).

[2] Namely, the National Democratic Alliance, the Popular Action Bloc, the Hadas (Muslim Brotherhood), the National Islamic Alliance, and the Justice and Peace Alliance.

[3] In this case, the *ex officio* members do not have a vote.

[4] This has happened, for instance, in November 2019 when Kuwait Prime Minister Sheikh Jaber Mubarak had to submit the resignation of his government to the Amir in order to avoid a possible vote of no-confidence by the parliament (Gulf News, 2019).

[5] The World Bank Governance Indicators provide aggregate and individual indicators for 215 countries and territories over the period 1996-2014, for 6 dimensions of governance (World Bank, 2019).

[6] Freedom in the World is an annual comparative assessment of political rights and civil liberties that covers 195 countries and 15 related and disputed territories. See: https://freedomhouse.org/report/freedom-world-aggregate-and-subcategory-scores.

[7] The Bertelsmann Governance Index and political Transformation Index cover respectively four and five dimensions, each of them constructed of several indicators (Bertelsmann Foundation, 2018).

[8] This section only provides a rapid overview of the different levels of the system. Strategic orientation, policy formulation and implementation are discussed in more depth in the subsequent sections.

[9] Confusion arises at times regarding the denomination “research and innovation councils”. These co-ordination and advisory bodies are not to be mistaken with research agencies or national science foundations, which have a mandate for funding, according to policy guidelines provided by national strategies or policies. Such agencies are sometimes called research councils (for example, this was the case in the United Kingdom between 2002 and 2018). In this review, the term “research agency” is used for such funding bodies.

[10] http://scpd.gov.kw/Default.aspx.

[11] The deputy prime minister and Minister of Foreign Affairs, the deputy prime minister and Minister of State for Cabinet Affairs, the Minister of State for Housing Affairs and Minister of State for Development Affairs, the Minister of Oil and Minister of Electricity and Water, the Minister of Finance, the Minister of Health, the Minister of Public Works and Minister of State for Municipal Affairs, the Minister of Education and Higher Education, the Minister of Social Affairs and Labour, the Minister of Information, the Governor of the Central Bank.

[12] See the respective websites: UAE Vision 2021: https://www.vision2021.ae/en; Saudi Vision 2030: https://vision2030.gov.sa/en; Qatar National Vision 2030: https://www.gco.gov.qa/en/about-qatar/national-vision2030.

[13] This report is not publicly available. The OECD review team was not able to consult this report.

[14] The first five-year development plan covered the period 1967/68-1971/72.

[15] Information provided by SCPD.

[16] See: www.newkuwait.gov.kw.

[17] Seventeen vision-related tactical projects, 19 enablers and 88 vision-related operational projects.

[18] This estimate was done based on ongoing projects in February 2019, as available on the New Kuwait platform: www.newkuwait.gov.kw.

[19] See: https://valtioneuvosto.fi/en/research-and-innovation-council.

[20] Official statistics for R&D expenditure do not exist. Preliminary figure obtained by consolidation of data from Kuwaiti sources. Includes a very preliminary figure from KNPC, which is awaiting confirmation/revision

[21] This amount of government funding built upon the data presented in the Chapter 2, excluding non-governmental external funding (hence excluding, for instance, funding from foreign sources and domestic companies such as the Kuwait Oil Company) and business expenditures not financed by government (hence keeping the amounts of the grants provided by KFAS to companies).

[22] https://www.kfasacademy.com/.

4 Higher education and research in Kuwait

This chapter presents the Higher education and research activity in Kuwait. It starts with a brief overview of the general principles that govern effective higher education and research based on international experience. It then successively reviews the main public and private higher education institutions, and the research institutes, KISR in the first place. A final section discusses KFAS supports to research activities.

A higher education and research system is instrumental for supporting endogenous production of knowledge, pushing the knowledge frontier and supporting innovation, provided efficient transmission and diffusion mechanisms are in place. In addition, it strengthens the capacity to adopt and adapt international knowledge and maintains links to developments in science and technology worldwide. This function of science is particularly important for smaller countries and countries at a relatively early stage of development of their innovation capabilities to support the catch-up process.

In the Gulf region, Kuwait was among the first countries to establish a higher education and research system. It comprises the public and private higher education institutions (notably Kuwait University and the Public Authority for Applied Education and Training [PAEET]) and research institutes (the Kuwait Institute for Scientific Research [KISR], as well as some Kuwait Foundation for the Advancement of Sciences centres, i.e. Dasman Diabetes Institute and the Jaber Al Ahmed Centre for Molecular Imaging and Nuclear Medicine).

4.1. Main characteristics of an efficient higher education and research system

OECD analysis of research institutions in different countries and thematic areas has led to the identification of the main policy issues to help ensure that research contributes to innovation and social and economic development.

4.1.1. Governance and strategy of higher education and research institutions

Research and higher education institutions' missions

The missions assigned to different types of higher education and research institutions by relevant legislation and public policy set the basic premises of what institutions are authorised, forbidden and expected to do, and underpins more detailed specifications of goals, profiles and responsibilities within individual institutions. These missions should be clearly set out, translated into the institution's strategic plan (including relevant indicators and key performance indicators) and aligned with the priorities defined at the national level and the vision of how research is expected to contribute to achieving these overarching goals (notably in national strategies).

Institutional autonomy

Higher education institutions (HEIs) and public research institutions (PRIs) in the OECD countries have a high degree of autonomy or discretion in the design and implementation of their activities. Recruitment, promotions, creation of internal structures such as technology transfer offices, legal entities and industry partnerships are decided by HEIs in a large number of cases. Only the level of salaries remains predominantly determined at the national level (Borowiecki and Paunov, 2018). Autonomy enables institutions to optimise their performance based on their local situation and knowledge, free from micro-management. In recent decades, governments across the OECD have tended to increase public institutions' operational and financial autonomy in matters such as institutional strategy, infrastructure and staffing. Even more, they have supported the development of institutions' strategic leadership through training programmes and dedicated funding to encourage strategic planning.[1]

4.1.2. Funding of higher education and research institutions

Government incentives and funding. The incentives provided by government should drive institutions' activities at different levels (the institution as a whole, the faculties and departments, teams, and individual staff) towards achieving their objectives. Most countries use a combination of institutional funding for longer-term research and project funding. Institutional funding is distributed within institutions according to

specific modalities, depending on their internal strategy and the way this funding was allocated to them. An increasing number of countries (i.e. Australia, Norway, Spain, the United Kingdom) link institutional funding of research and HEIs to their performance (e.g. performance-based institutional funding, performance contracts, etc.), while still providing a stable funding base (funding based on size and history). Project funding is provided most often through competitive tenders by funding bodies of various types and forms, most often research agencies, as well as ministries themselves for more strategic and top-down projects. Non-governmental actors such as research charities and companies also provide project funding, to meet their own goals. The impact of this funding should be regularly evaluated.

The level and type of funding available to institutions to pay staff, provide buildings and equipment, and implement their activities should be commensurate with their objectives. In most OECD countries, a majority of higher education and research institutions are highly dependent on public funds, meaning that the level of government resources available and the mechanisms through which these resources are distributed in the system have a significant impact on institutional activities and behaviour.

4.1.3. Human resources

Internal structure of incentives. The effectiveness of the higher education and public research system depends fundamentally on the staff who work in institutions and research units. Having well-trained, motivated staff is a pre-requisite for any effective system. This depends notably on the internal incentives in place in the different institutions. These include the allocation of financial resources among the different faculties, departments and teams, as well as career development mechanisms, human resource appraisal systems and some remuneration schemes (e.g. bonus for publications, patents or industrial contracts).

4.2. Higher education institutions

The main HEIs performing research in Kuwait, in terms of the number of researchers and the amount of research they perform, are Kuwait University (KU), Kuwait Institute for Scientific Research (KISR), the Public Authority for Applied Education and Training (PAAET) and some 12 private universities.

4.2.1. Kuwait University

KU was established in 1966, initially as a teaching university with 4 colleges, 418 students and 31 faculty members. It performed very little research until 1979, when research activities were added to its mission. By 2005-06, KU had grown to 14 colleges, and was comprised of 17 colleges in 2019, educating 36 704 undergraduate and graduate students with a total staff of 1 577 faculty members (Table 4.1).

Table 4.1. Kuwait University's colleges, 1966 and 2019

	1966	2019
Colleges	College of Science College of Arts College of Education College for Women	Allied Health Sciences Architecture Arts Business Administration Computing Science and Engineering Dentistry Education Engineering and Petroleum Law Life Sciences Medicine Pharmacy Public Health Science Sharia and Islamic Studies Social Sciences College of Graduate Studies
Students	**418**	**37 652**
Faculty members	**31**	**1 684**

Source: Kuwait University.

Kuwait University's overall performance

Although rankings are in a number of ways problematic,[2] they provide a useful way to examine KU's performance compared to its peers globally and in the Gulf region across a number of performance criteria (teaching, research, knowledge transfer, industry income, and international outlook). KU does not appear in the Centre for World University Rankings or Shanghai rankings and is included in Times Higher Education University Ranking since 2017. The 2020 and 2019 Times Higher Education (THE) University Rankings placed KU in the range 801-1 000 (601-800 in 2017 and 2018) in the world, well behind King Abdulaziz University in Saudi Arabia (201-250) or Khalifa University in the United Arab Emirates (301-350 in 2019; 351-400 in 2020), but in front of Imam Abdulrahman Bin Faisal University in Saudi Arabia (1 001+ in 2019 and 601-800 in 2020). It ranks tied for 9th among the 15 Gulf country universities included in the THE world rankings. KU's ranking is particularly affected by its low research sub-score (research income, reputation survey, research productivity), citation sub-score and its relationships with industry (industry income). This ranking also provides a new ranking based on universities' performance against the United Nations' Sustainable Development Goals (SDGs). KU reached 84th (of a total of 456 universities), assessed based on their contribution to 4 SDGs.[3]

KU has engaged in significant efforts to improve its monitoring system. While the most recent monitoring report is from 2014/15, significant data were provided to the OECD review team as part of this study. This set of data allows to compare some of the intentions with apparent achievements and is suggestive of the conditions under which the university operates. Table 4.2 shows some of the strategic targets and their degree of fulfilment by the second half of 2019.

Table 4.2. Kuwait University Strategy 2013-17: Comparison of selected targets for 2016/17 and achievements

Targets	Achievements
Increase enrolment in labour-shortage subjects, especially STEM, so that 35% of its students would be graduating from scientific colleges in 2017, 35% from professional ones and 20% from humanities	22% of first-degree graduations in 2016/17 were in science, engineering and medicine; 54% in social sciences; and 24% in humanities.
Send at least 80% of scholarship students to the world's top 100 universities	Achieved
Achieve student-to-faculty ratios optimal for each college, in part by recruiting more faculty	The ministry's requirement for Kuwait University to enrol 2 000 extra students without allocating any extra budget has increased rather than optimised these ratios. The ratio of students to faculty is 24:1, which is much less favourable than in most leading universities.
Increase the number of postgraduate students by 30%	By 20171/8, a 15% increase had been achieved.
Introduce five new PhD programmes by 2016/17, in addition to the six already running (for a total of 11 programmes)	12 PhD programmes operating in 2018/19.
Increase scientific productivity by 10% per year	There has been a consistent decline in output since 2012-13 according to Kuwait University internal monitoring data which include almost exclusively publications from *funded* project. OECD analysis of Scopus data (covering all publications with a KU author) shows an increasing trend.
Be among the 500 best universities in the world for research by 2016/17	Kuwait University is not listed in the top 500 of any global university ranking.

Source: Data provided by Kuwait University.

The strategy also sets out a number of goals to improve efficiency and reduce bureaucracy. These are difficult to measure, but faculty complaints about these continue unabated. Interviews and internal KU documents reveal that the following factors hinder research performance:[4]

- difficulty in collaborating with internationally leading researchers and institutions;
- lack of incentives for academics to initiate new research projects;
- disincentive to seek external funding due to budget rules;
- inefficiency and lengthy lead times in the Purchasing Department;
- lengthy delays in securing approvals to recruit skilled workers and research assistants from abroad;
- inability to transfer research budget between financial years;
- too small budget allocated for research;
- item-based budgets allowing no flexibility and adequate programme planning and management;
- low rates of pay and short contract duration for people hired on research grants.

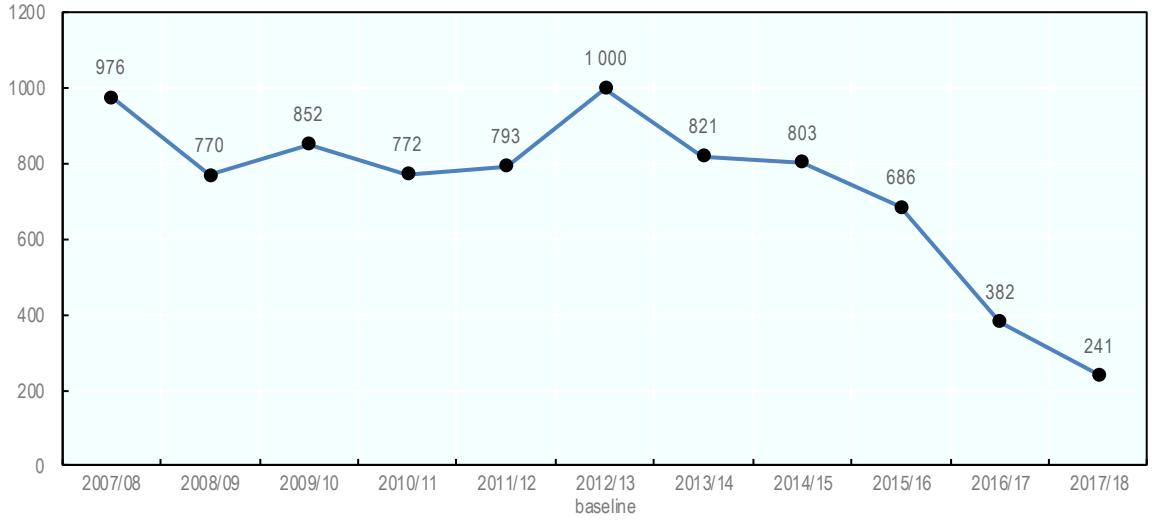
A thesis on academic freedom at KU in 2010 offers a similar list of complaints, based on a survey and interviews with KU academics, which tends to show that the situation has not improved (Ghareeb, 2010). This is confirmed by data from KU's internal monitoring system. The average duration of research procedures, which includes notably the crucial issue of equipment procurement, slightly improved from 2012-13 to 2014-15 (from 18.5 months to 16 months) before rising again each year up to 21 months in 2017-18.[5] This is consistent with information collected in interviews (not only at KU, but also in KISR) concerning the increase of the level of red tape and the pervasive pressure of budget audits.

KU's research performance

The number of KU researchers' publications in 2017/18 is about a fourth of what it was in 2007/08 and 2012/13 (Figure 4.1). This is very far from the university target of a 10% increase per year. The proportion of faculty members with publications to total faculty has also regularly decreased in recent years, from 30% in 2012/13 to 21% in 2017/18,[6] compared to a university target of 40%. While the number of citations is

not formally part of the KU monitoring system, an indicator of research quality is provided by the number of publications in journals with different citation performance. The number of publications in Q1[7] publications, or the top 25% most-cited journals, has also decreased, from 200 in 2015/16 to 100 in 2017/18 (against a target of 209).

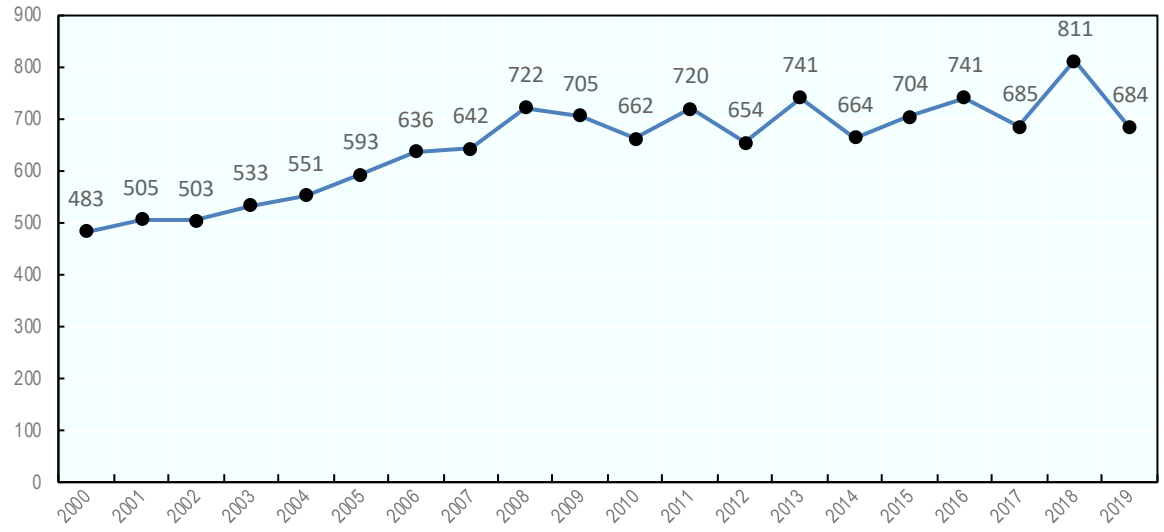
Figure 4.1. Number of scientific research publications by Kuwait University staff, 2007/08-2017/18, based on KU monitoring data



Source: Kuwait University website, Office of the Vice-President of Research, http://www.ovpr.ku.edu.kw/index.php/en.

As explained in Table 4.2, KU's own account of its publications mostly includes publications that originated from funded projects and therefore overlook most publications produced in a different institutional context. Only 241 publications are reported for 2017/18, while OECD analysis based on Scopus (which includes al publications regardless of the origin of the funds) puts that number at more than 800 (Figure 4.2).

Figure 4.2. Number of scientific research publications by Kuwait University staff, 2000-19, based on the Scopus database



Note: Only articles are included (i.e. conference papers, book chapters and notes are excluded).
Source: Scopus database, https://www.scopus.com/search/form.uri?display=basic (accessed on 11 January 2020).

Kuwaiti researchers co-operate with a diversified set of partners. At the end of the 2000s and today, KISR is a major research partner of KU, as shown in the co-publication data in Table 4.3. The medical faculty demonstrates good links to some national hospitals, directly or through the Ministry of Health. Two international private universities based in Kuwait have become significant partners (twice as frequently as PAEET).

Table 4.3. Main Kuwait University co-publication partners, 2008-10 and 2017-19

2008-10		2017-19	
Health Sciences Centre, Kuwait Faculty of Medicine	27%	Health Sciences Centre, Kuwait Faculty of Medicine	26%
Ministry of Health Kuwait (including hospitals)	10%	Ministry of Health Kuwait (including hospitals)	13%
Public Authority for Applied Education and Training Kuwait	3%	Cairo University	2%
Dasman Diabetes Institute	3%	Public Authority for Applied Education and Training Kuwait	2%
Cairo University	3%	Quaid-i-Azam University	1%
Universiti Kebangsaan Malaysia	2%		

Note: The Health Sciences Centre is part of Kuwait University.
Source: Scopus database, https://www.scopus.com/search/form.uri?display=basic (accessed on 11 January 2020).

The United States, the United Kingdom and Egypt have been the main partner countries since at least 2008 (Table 4.4). While the overall number of partnerships grew across the period from 1 606 to 3 298, most of the major partner countries were still significant in the later period. Pakistan, however, declined substantially as a partner while the People's Republic of China (hereafter "China") grew.

Table 4.4. Kuwait University co-publication countries, 2008-10 and 2017-9

2008-10		2017-19	
United States	19%	United States	15%
United Kingdom	8%	Egypt	8%
Egypt	7%	United Kingdom	7%
Canada	6%	Saudi Arabia	6%
India	4%	Canada	5%
Pakistan	4%	Iran	4%
Saudi Arabia	4%	Malaysia	4%
Australia	3%	Australia	4%
United Arab Emirates	3%	United Arab Emirates	4%
Iran	2%	Germany	3%
France	2%	Jordan	3%
Japan	2%	Italy	3%
Germany	2%	India	3%
Norway	1%	France	2%
Oman	1%	Brazil	2%
Italy	1%	Japan	2%
Netherlands	1%	Spain	2%
Finland	1%	China (People's Republic of)	2%

Source: Scopus database, https://www.scopus.com/search/form.uri?display=basic (accessed on 11 January 2020).

KU's research has not yet translated into significant innovation outputs, as measured by patents and disclosures (Table 4.5). Its intellectual patent office was created in 2005. KU's commercialisation activities only started in 2018, with negotiations initiated on one research project (phase change memory materials). As of 2019, three additional projects are in the commercialisation pipeline.

Table 4.5. Kuwait University's innovation outputs

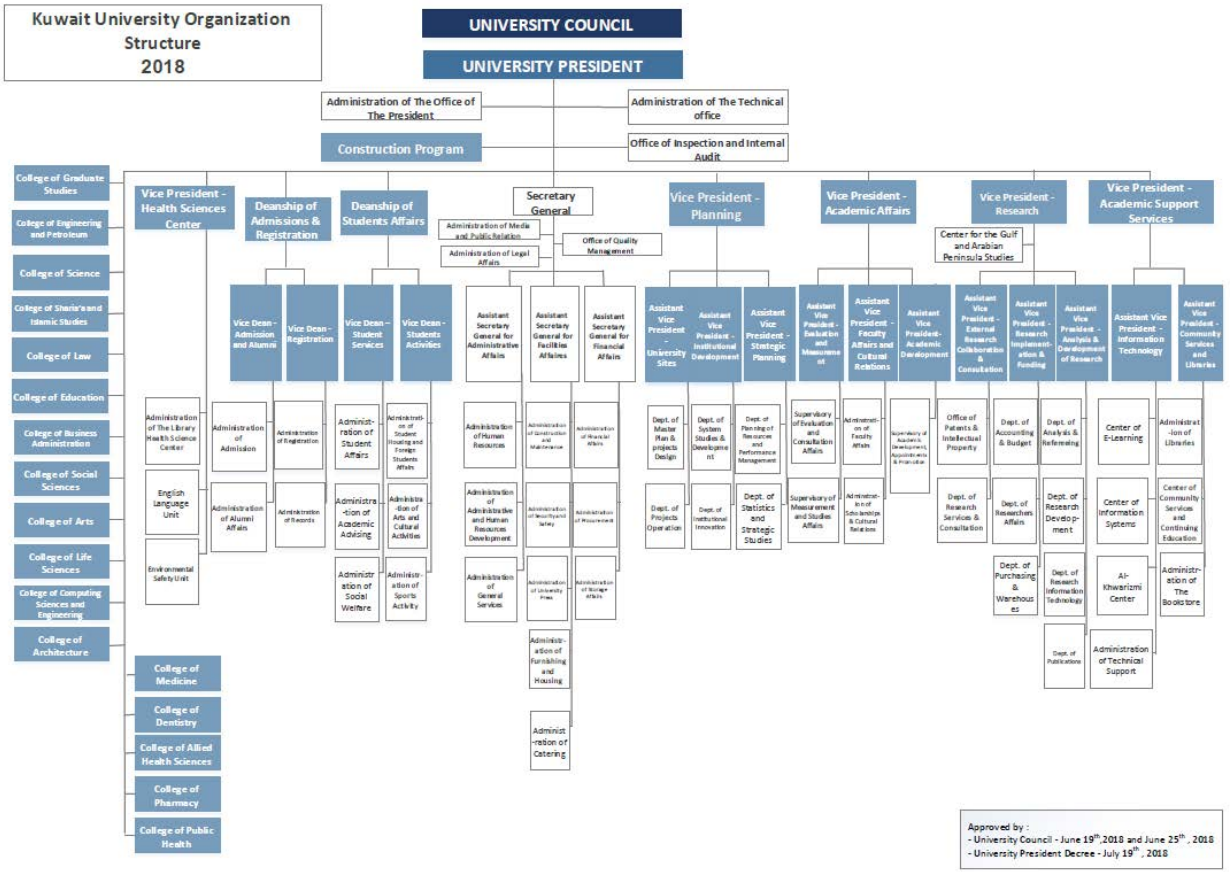
Type of output	
No. of disclosures	93
No. of patents applied	8 (ongoing)
No. of patents obtained	49
No. of out licenses	–
Revenues	–

Source: Information provided by Kuwait University.

Governance

KU is governed by a large council, chaired *ex officio* by the Minister of Higher Education (Figure 4.3).The under-secretaries from the education and higher education ministries are members as are three eminent Kuwaitis who represent the government sector; another three are from the private sector. Members include the university president and secretary general (both appointed by Amiri decree) as well as 17 deans of faculty. Funded research activities are managed by the Research Sector, headed by the Vice-President for Research. The Office of Patents and Intellectual Property Rights is placed under the supervision of the Assistant Vice-President Research for External Collaboration and Consultation.

Figure 4.3. Organisational chart of Kuwait University (2018)



Source: Kuwait University.

These arrangements allow for some societal influence on the university's overall direction, but which is reduced due to the power of colleges, where academics play a strong role. Over the past three decades or so, European universities have – at varying speeds and under different forms – been moving from collegiate governance to executive governance with societal representation. The board, with a majority of societal representatives, sets the institution's strategy and appoints the rector, while academic aspects of governance are left to the academics. In these universities, this shift in strategic power away from individual departments and colleges allows a "smarter" orientation and profiling of universities. This is crucial to allow universities to act strategically as integrated entities. The Netherlands is one country where ambitious reforms of the governance of universities have been implemented since the early 1970s (Box 4.1).

Box 4.1. Moving from collegiate governance to executive governance: The example of Dutch universities

Grounded in the idea that the Netherlands is a small country and therefore cannot excel at everything, prioritisation has been a constant in Dutch research policy.

Since the early 1970s, a series of reforms have gradually moved Dutch universities from a senate composed of professors responsible for the academic governance component and a board of curators for the administrative components to a new governance structure with strong leadership at the top level of the institutions.

The key elements of the new governance structure following a reform in 1997 are (World Bank, 2016):

- Establishment of a supervisory board with external members appointed by the government, which appoints the executive board and assumes a supervisory and control function, among others by approving institutional strategies, budgets and annual reports.
- Revision of the role of the executive board, which became the main decision-making and management body of universities.
- Revision of the role of the university council, which now has mostly an advisory role and consists exclusively of staff and student representatives.
- Strengthened position of deans or faculty boards as the most important decision-making instances on the faculty level (implying a mostly advisory role for the faculty councils). A study by the Rathenau Institute showed that deans play a key role to amend the faculty allocation model and research strategy in order to, notably, improve the faculty's strategic profile in order to attract outstanding researchers and/or develop new research fields (Koier et al., 2016).
- Replacement of the previous system of electing leaders by a system of appointments, ranging from the executive board, which is appointed by the supervisory board, down to the programme directors, which are appointed by the deans.

These changes were accompanied by enhanced autonomy for universities. The state decided in the 1980s to only use indirect steering mechanisms, i.e. mainly confining itself to the development of the broader framework conditions and granting greater latitude for self-steering to the universities.

Sources: World Bank (2016), International Trends and Good Practices in Higher Education Internal Funding and Governance, https://www.che.de/wp-content/uploads/upload/LV_2nd_HEd_RAS_Ph1_Trends_and_Practices_20Dec16_post_review_final_2055.pdf; Koier, E. et al. (2016), Spinning Plates: Funding Streams and Prioritisation in Dutch University Research, https://www.rathenau.nl/en/knowledge-ecosystem/spinning-plates.

Strategy

KU's current Strategic Plan covers the period 2018-22. It consists of a short five-page document, presenting some generic objectives and goals:

- prepare a highly competitive graduate with leadership skills;
- produce high-quality research;
- offer high-quality training and consultation services;
- maintain highly-qualified and professional administrative and financial management.

This document was the result of significant internal and external consultations, notably through numerous workshops involving all KU colleges and centres, at all organisational levels, as well as external stakeholders.[8] These consultations were performed in order to develop the Strategic Plan but also, once finalised, to translate this plan into operational action plans for all of the university's operating units. The Office of the Vice President of Planning held numerous workshops in all colleges and working to deploy the Strategic Plan and help them prepare their respective Action Plans.

The Strategy is built around four main dimensions (quality, innovation, sustainability and global visibility). Each of them includes two to four goals, which are in turn decomposed in objectives and 'examples of initiatives'.

KU's strategy for 2013-17 (KU, 2015) was even more detailed, pointing to needs for improved performance on many dimensions and setting precise targets for each goal and objective. It covered all aspects of university operations, focusing on process improvements and better adapting the university's performance to societal needs.

The Strategic Plan is used deliberately as a generic call for initiatives: colleges and departments are invited to submit proposals of initiatives under the strategy's generic objectives and goals. Under each of the four main dimensions, KU monitors the list of proposed initiatives with dedicated KPIs. However, the strategy therefore includes no particular orientations beyond broad objectives that could help the strategic management in attempting to strengthen a specific institutional profile and support some priorities that could federate efforts beyond individual and dispersed initiatives. Interviews with the university tended to show that there is little ownership of the strategy throughout the university and that it is perceived to a large extent as a distinct process stemming from the Planning Sector, with only modest influence on the direction of research activities. One key issue hindering the strategic process – besides cultural issues – relates to the fact that it is not supported by additional funding prospects that would help the strategic profiling of the university, and initiatives have to be financed by the budgets of the different initiators. There is, therefore, little incentive to propose initiatives besides what the different parts of the university would have proposed in the absence of the strategy. In the research area specifically, the severe budget cuts that faculty had to endure and the significant increase of the administrative burden and delays have reduced the motivation to engage in ambitious actions. Based on the premises of its benefits, several governments have used different ways to promote institutional profiling, building on the strategic exercises of universities: excellence schemes, training of universities' strategic leadership, funding for projects in line with the university strategy and, last but not least, legal frameworks and rule setting (e.g. accreditation system, university governance rules, degree of autonomy of individual universities), performance-based funding schemes and performance contracts (Box 4.2).

Box 4.2. Lessons learnt on institutional profiling of universities and how to support it

A considerable literature has analysed the growing trend of diversification of higher education institutions, in particular since the 2010s. This trend is fuelled by heightened global competition for talent and funds, which requires universities to make themselves more visible on the international stage and distinguish themselves from competitors by developing a clearly differentiated strategic profile The benefits are usually of two main types, whether it is considered at the level of individual institutions or at the level of the overall higher education landscape.

At the level of individual institutions, the profiling of universities consists in specialising in their core strengths, which, if successful and up to a certain level (hence avoiding overspecialisation), leads to an increase of their performance, as measured, for instance, in international rankings

At the level of the overall higher education landscape, the specialisation of institutions is generally found to increase the overall dynamic efficiency of the sector, as it increases intra-organisational homogeneity and systemic diversity (although a direct causality is hard of course to establish and many studies are based on narratives rather than measurements). A diversified higher education landscape can reduce overlap and unnecessary competition, improve the average level of universities altogether, allow for more fruitful university co-operation, increase the local relevance of their activities and allow for better catering to the heterogeneous needs of stakeholders (including students, firms, administrations, etc.), offer more opportunities for social mobility (Huisman, 2017) (Huisman et al., 2015).

Although rather simple to understand in theory, it proves in many cases difficult to implement, since this trend towards strategic profiling can, at times, create internal tensions within institutions which have a long-established tradition of maintaining wide academic portfolios based on significant power from “autonomous” faculty staff. The bottom-up process that drives institutions’ decisions with regards to teaching and research areas automatically promote internal diversity, rather than a focus on key strengths. The pressure to focus on a limited number of specialist disciplines or research areas may therefore require a challenging balance of concerted efforts and strategic leadership.

Some universities have, for instance, embarked on strategic review exercises, defining a selection of areas to which most disciplines represented in the university can contribute. For instance, the Friedrich-Alexander University (Germany) dedicates internal funding to promote outstanding, preferably interdisciplinary, research projects at an early stage and in a flexible and non-bureaucratic way, in order to prepare them for external funding. This internal funding scheme for excellent research is expected to enhance the university’s reputation as a leading university, develop its unique selling points, improve its attractiveness as an employer for excellent researchers both from Germany and from abroad, and expand its strategic alliances with key partners. The university has created a matrix structure, composed of eight main research areas covering different academic fields, broken down into focus areas in each faculty. A process has been set up to keep this structure up to date, on the basis of various indicators used as proxies for the importance of a research area to the university (number of research-active staff in the area, third-party funding, scientific impact and international reputation) (Pruvot, Claeys-Kulik and Estermann, 2015). The strategic leadership of the University of Tromso in Norway has set up a central university budget (financed, for instance, from vacancies and indirect costs of other projects) for funding specific flagship “structuring” projects (OECD, 2017). Other universities may provide seed funding to high-potential initiatives in order to help them reach a level where they can be turned into excellence scheme proposals.

The following good practices have been identified in reviews of university profiling (Hanover Research, 2013):

- strategic planning involves: formulating goals, objectives and action steps; and monitoring implementation, tracking progress and revising the plan, based on comprehensive institutional research
- linking strategic accomplishments to administrators' performance evaluations may also help to incentivise implementation
- involving stakeholders in the planning process can help build broad support among diverse constituents
- aligning the budget with the strategic plan helps increase the plan's impact
- the plan should answer the question: "How will we know if we reach this goal, and how will we prove it?"
- reporting annually on the institution's progress can sustain momentum after the plan has been approved.

Sources: Huisman, J. (2017), "Institutional diversity in higher education, institutional profiling", https://dx.doi.org/10.1007/978-94-017-9553-1_32-1; Huisman, J. et al. (2015), "Measuring institutional diversity across higher education systems", https://dx.doi.org/10.1093/reseval/rvv021; Hanover Research (2013), *Strategic Planning in Higher Education: Best Practices and Benchmarking* https://cdn2.hubspot.net/hubfs/3409306/Nurturing/Content%20Asset%20Downloads/Higher%20Education/Reports%20and%20Briefs/Strategic-Planning-in-Higher-Education-Best-Practices-and-Benchmarking.pdf?__hssc=12093739.1.15765017823 19&__hstc=12093739.217f336c38d57. Pruvot, E.B., A.-L. Claeys-Kulik and T. Estermann (2015), *Designing Strategies for Efficient Funding of Universities in Europe*, https://eua.eu/downloads/publications/designing%20strategies%20for%20efficient%20funding%20of%20universities%20in%20europe%20define.pdf; OECD (2017), *OECD Reviews of Innovation Policy: Norway 2017*, https://doi.org/10.1787/9789264277960-en.

Funding

KU's budget is negotiated directly with the Minister of Finance. Once agreed upon, it is then approved by the parliament. Figure 4.4 shows KU's operational and capital expenditures. Operational expenditures have grown since 2010/11, reflecting increases in student numbers. The university went through significant operational budget restrictions in 2015/16 and 2016/17, leading the university to reduce expenditures across the board (except basic staff costs). The main budget increases during the decade were related to capital expenditure, reflecting new construction activity, in particular the construction of the new Sabah Al-Salem campus since 2011/12.

According to available data, the operational budget per student decreased from roughly KWD 9 200 (20 000 students) in 2007/08 to about KWD 7 120 in 2015/16 (36 661 students). Since then, the budget has suffered further cuts while the number of students has remained stable (36 704 in 2018/19).[9]

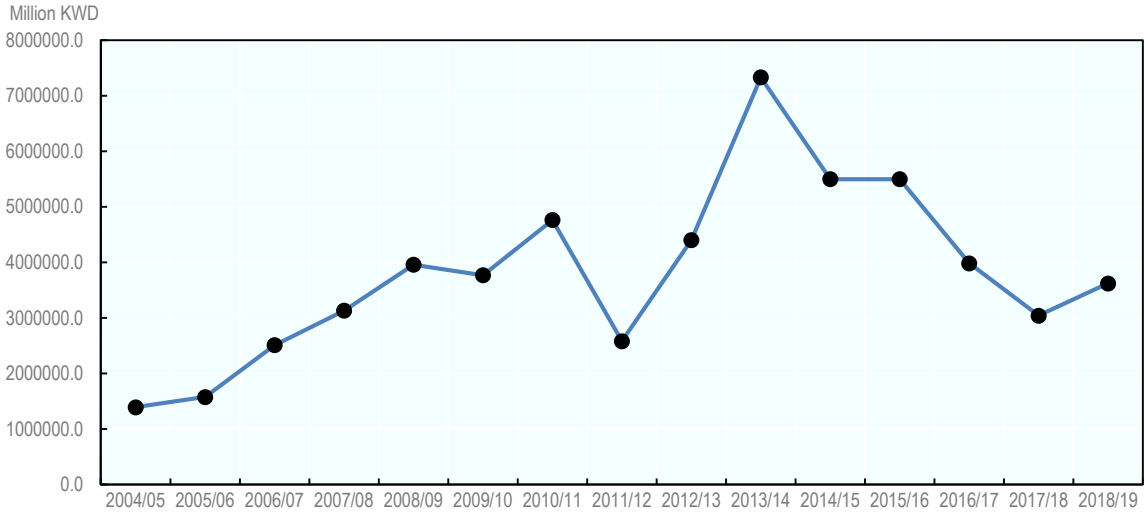
Figure 4.4. Kuwait University's operational and capital expenditures, 2007-19

Source: Monitoring data provided by Kuwait University.

The research budget is based on a proposal prepared by the Research Sector and transmitted to the KU central administration, which integrates it in the total KU budget proposal submitted to the Ministry of Finance. According to information provided by KU, the Research Sector has consistently received budgets substantially less than requested. The budget cuts on the research budget were indeed extremely severe from 2013 to 2018 (Figure 4.5).[10] Even outside periods of budget restriction, the institutional research budget (not including staff costs) is still small and volatile.[11] It has tended to be 1-2% of the operational budget over the last decade, which might reflect that it is still not seen as a priority, not only by the Kuwaiti government, but also, as claimed by some faculty members, by the university council and leadership.[12]

As previously mentioned, these budget figures do not include staff costs. In the absence of monitoring the time spent on research activities, determining these costs requires making some assumptions. While faculty is expected to dedicate 30% of their time to research according to a university rule,[13] it is certainly less in reality, since not all faculty is "research active". According to the KU monitoring system, 21% of faculty members had publications originating from funded research in 2017/18. However, using the 30% hypothesis, a rough estimate provides a staff cost for research of KWD 20.4 million.[14] Based on this estimate, the total research budget for 2017/18 is about KWD 24.4 million (including staff cost and external funding), hence about 10% of the university's operational budget.

Figure 4.5. Kuwait University's research budget (not including faculty member costs), 2004-19



Note: The research budget figures include costs of equipment, consumables and wages of the few temporary and permanent researchers (not faculty members).
Source: Monitoring data provided by Kuwait University.

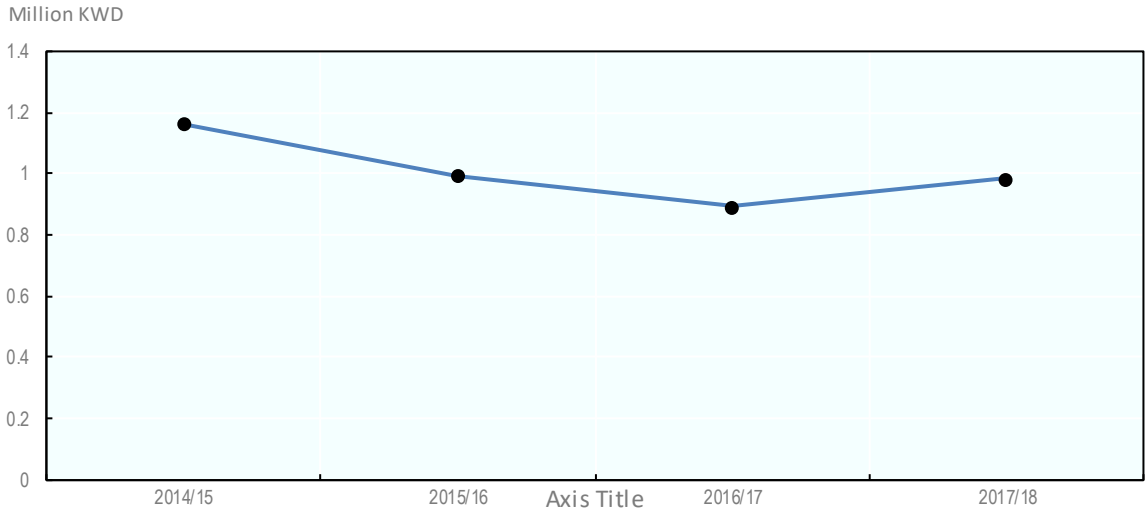
According to the Ministry of Finance, the budget fluctuations not only reflect budget restrictions imposed to KU, but also the fact that some planned expenditures under research budget lines were not realised in previous years. This low research budget execution can find its roots in both the limited research capacity of KU and the many bureaucratic restrictions (including regarding the item-based budget development and allocation) that hinder research activities. Regardless of the reasons, the effects of such drastic cuts were said to be devastating for staff motivation, and seem to persist even though the budget has somewhat recovered in the last two funding periods.

In addition to budget cuts, one critical hindering factor for KU – and other public institutions – is tighter control of the civil service commission and auditing services. This has resulted in a significant increase in monitoring and a reduction in autonomy. KU's budget, which formerly had eight lines specified by the ministry, has now been restated in some 2 000 budget lines among which it is very hard to reallocate resources. As a result, as mentioned earlier, some of the budget goes unspent and has to be returned to the Ministry of Finance. This goes against the current trend of increasing autonomy and performance-based governance and funding of universities in many countries (OECD, 2018a). A recent OECD survey shows that HEIs enjoy a high degree of autonomy in recruitment, promotions, and the establishment of legal entities and partnerships (in excess of 85% of OECD countries). In 68% of OECD countries, public HEIs take their own decisions to allocate institutional block funding to teaching and research (OECD, 2018b).

KU is trying to implement a system of programme budgeting in order to rationalise budget execution and be able to monitor the achievements related to expenditures on different programmes. However, although laudable, it is unlikely that this endeavour could result in significant results if the initial budget allocation is increasingly itemised by expenditure line, rather than related to programmes and goals, and inflexible. As claimed during interviews, there are few linkages between the strategic steering of the university – in the hands of the university Council and the Planning Sector – and the budget allocation process managed by the Ministry of Finance.

In addition to the institutional funding allocated to the Research Sector as part of the university's total funding, researchers can receive external grants (mainly from domestic sources: KFAS, but also to a lesser extent from other organisations such as KISR, the Kuwait National Petroleum Company, the Kuwait Oil Company [KOC] and the Kuwait Petroleum Corporation). In recent years, the amount of external funds raised by KU researchers has remained around KWD 1 million (about USD 3.3 million) (Figure 4.6).

Figure 4.6. Annual external contribution to research funding at Kuwait University, 2008-18



Source: Monitoring data provided by Kuwait University.

Finally, a significant complication is that any contract research or grant income has to be deducted from the university's funding allocated by the Ministry of Finance, removing the economic inventive for the university to do such work. All staff efforts to secure external funding therefore result in extra work to implement the related projects, without funding to cover the additional costs. Moreover, given the limited budget and the lack of budget flexibility, there is almost no possibility to reallocate part of the "core" funding toward these new activities. This results in low levels of external funding. External funding still represents a significant proportion of the total research budget in recent years (about one-third in 2017/18), given the limited size of the total research budget. In the past, external funding originated almost exclusively from KFAS. A four-year partnership recently signed with the KOC will add about KWD 0.5 million per year.

As already mentioned, appropriate funding and steering mechanisms are prerequisites for high-performing, entrepreneurial and innovative universities. These mechanisms are increasingly linked in many countries by using performance agreements (or "contracts"). These have gained importance to reward the performance of HEIs and PRIs across the OECD (Box 4.3).

Box 4.3 presents some recent OECD trends and takes a closer look at the Austrian case. Another interesting case for Kuwait is Luxembourg, which instituted a comprehensive system of multiannual performance agreements to steer and fund its unique university (OECD, 2016b).

Box 4.3. Performance agreements as mechanisms to link the steering and funding of universities: Results of an international survey and insights from Austria

OECD Database on STI governance (2018)

Performance agreements between institutions and their public authorities set performance targets and, in most cases, bind a share of their institutional funding allocation. Such agreements are in place in 13 OECD countries (7 of which have introduced them in the last decade) and at least 6 regions/federal states. There are significant differences across countries on a number of aspects of performance contracts, including the shares of higher education institutions' (HEI) budgets that are subject to performance contracts (from 1% in Denmark to 100% in Finland). Other differences relate to the targets they define and the way they do so. Targets are used to monitor the performance of HEIs and to assess whether their objectives have been met. While education and research targets are as expected the main criteria used in 11 of 11 countries with such information, 9 countries focus on HEIs' role in support of innovation performance, 4 address socio-economic challenges and 5 include targets to support to the local economy.

Performance agreements in Austria

In Austria, to steer public universities towards achieving the government's strategic objectives for tertiary education and research at universities, the Federal Ministry of Science, Research and Economics has three "cascading" instruments at its disposal: the University Development Plan; the development plans of each individual university; and the performance agreements.

The current Austrian University Development Plan (2019-24) presents eight systemic objectives providing a strategic framework for all universities to develop their individual development plans. Based on the individual development plans, performance agreements are negotiated on a three-year cycle between the ministry and each university. These agreements define a concrete set of measures and services based on the respective university's development plan, covering aspects of strategic and profile development, research and teaching, as well as other areas of university activities reflecting the so-called "third mission" of universities (i.e. societal engagement of universities, knowledge transfer and co-operation). They are the basis for the allocation as a lump sum of a large part (about 92% in 2018) of the public institutional funding to the universities. The achievement of the agreement's targets is monitored in frequent "performance dialogues" between the ministry and each individual university. The procedures and steps that need to be undertaken in cases where targets are not met are also laid down in the performance agreements (however, no real sanction mechanisms are foreseen, which has been criticised). Furthermore, universities report their activities and outputs in the form of annually updated indicators.

These performance agreements have been criticised, notably for their lack of impact on the strategic steering of Austrian universities. They, however, represent an interesting case where a productive dialogue on the future of each university is maintained with the funding authorities, allowing an essential learning process for both sides of the negotiation. Austria is currently starting its fifth round of performance agreement for the period 2019-21 and the agreements have significantly evolved since the first round started in 2007. When initiating such contractual arrangements, it is therefore critical to put in place adequate conditions for continuous forward-looking interactions between the different parties involved and regular assessment.

Sources: OECD (2018c), OECD Reviews of Innovation Policy: Austria 2018, https://doi.org/10.1787/9789264309470-en; AIT et al. (2017), "Background report OECD Review of Innovation Policies: Austria", mimeo; Borowiecki, M. and C. Paunov (Borowiecki and Paunov, 2018), "How is research policy across the OECD organised?: Insights from a new policy database", https://doi.org/10.1787/235c9806-en

Human resources

The total staff of the university comprises 6 815 people, of whom only 23% (1 591) were academics in 2017/18. For comparison, the ratio of academic to non-academic staff in the UK university sector is close to 1:1.

As a result of the long-standing Kuwaitisation policy, a third of the staff and only a fifth of the faculty is non-Kuwaiti. However, as in many other sectors, expatriates represent 59% of technical staff and basically all handicraft workers. The role of the expatriate academics appears as capacity-building for a limited period of time, rather than driven by the need to strategically build long-term capabilities in the university's priority areas. This is very different from the practice in countries that are highly successful in research, such as Luxembourg, Sweden, Switzerland, the United Kingdom and the United States (Box 4.4), which encourage a high inflow of talented foreigners into tenure-track positions (or their equivalents) and usually make it possible for them to become citizens. In effect, these countries exploit a talent pool that is much bigger than the size of their country would suggest, and the bibliometric evidence is that this pays off. KU will need to follow suit if it wants to be competitive in global research.

A study on staff satisfaction carried out in early 2017 shows that the non-Kuwaitis that do find a position in Kuwait universities (business colleges only) are relatively satisfied in spite of the lower job security and that non-Kuwaitis are on average more satisfied with their jobs than Kuwaitis (Al-Mutairi, Naser and Al-Enezi, 2017). This result holds true for both state universities and private universities.[15]

Box 4.4. Attracting foreign talents in Luxembourg

As a small country with a relatively young research system with little visibility and reputation, the performance of Luxembourg's research system depends heavily on the calibre of the researchers it is able to attract from abroad.

Against this backdrop, the government has set specific schemes to attract the best international talents, durably establish them in the national higher education and research system, and maximise the knowledge spill-overs from these scientists. The Luxembourg National Research Fund (FNR) has two dedicated programmes to attract outstanding scientific talent to Luxembourg: PEARL and ATTRACT.

PEARL is designed to attract leading researchers not yet established in Luxembourg. Beneficiaries are offered a research grant for five years, which covers all aspects related to the development of a research programme, including major research equipment, infrastructure and data collection, as well as the necessary funding to set up a team. The programme selects, on average, one or two candidates a year (corresponding to EUR 3-4 million per beneficiary). During the period 2014-17, the FNR dedicated about EUR 25 million to this scheme. The recruiting research organisation is expected to allocate matching funds to the FNR grant. One important aspect is that the awarded financial contribution can be used flexibly to implement the research programme at the host institution in order to be successful in his/her research programme and build up his/her team. Another remarkable feature is that the supported researcher is accompanied by a Scientific Advisory Board that helps him/her steer the programme and report on the progress of the PEARL to the FNR.

The selection is performed in two stages. During the pre-proposal stage, a short list is done via a Strategic Merit Assessment by a dedicated PEARL standing panel. This assessment includes the applicant's fit to the respective institutional strategy, international relevance and long-term development of the field. The panel also assess the commitment of the host institution to the PEARL programme in terms of financial contributions and other forms of support (personnel, infrastructure or other additions to the project). This is considered by the FNR as key evidence that the supported position is truly part

of a long-term investment in a strategic area of development for the host institution. In the full-proposal stage, the applicants' proposals are assessed by at least three international experts in the field, followed by interviews with a scientific panel. Experts look at the candidate's scientific excellence, the scientific quality and innovativeness of the underpinning research programme, and its expected research impact. The impact is an additional way to look at the sustainability of this heavy investment, as it consists in an assessment of the potential to establish a productive and sustainable research group which will make significant contributions to the current knowledge in the field and in the training of the next generation of researches.

ATTRACT is designed to attract young researchers to Luxembourg. It works in a similar manner to PEARL, but targets young researchers with two to eight years of professional experience since completing their PhD. The selection of proposals in ATTRACT is done in two stages, as for PEARL. The Strategic Merit Assessment pays particular attention to the contribution of the applicant's project to the development of a given priority area for Luxembourg. Selected candidates receive individual grants of EUR 1.5 million for starting investigators (postdoc and junior researcher level) or EUR 2 million for consolidating investigators (established researcher level) for five years). This significant amount enables the beneficiaries to set up their own research group in a domain of strategic relevance to the host institution. Here also, the sustainability of the position is a priority: the beneficiary, if successfully evaluated, can obtain a tenured position in Luxembourg after the grant ends. As for PEARL, ATTRACT applications must be submitted jointly by the hosting institution and the young researcher and require a strong and durable partnership.

Sources: OECD (2016), OECD Reviews of Innovation Policy: Luxembourg 2016, https://doi.org/10.1787/9789264232297-en; STIP-Compass database, https://stip.oecd.org/stip.html; FNR website, https://www.fnr.lu/funding-instruments/pearl and https://www.fnr.lu/funding-instruments/attract

The financial conditions at KU could help attract foreign academics, since salaries are internationally competitive (KWD 3 000 per month for an assistant professor and about KWD 5 000 for full professors, free of income tax). The working conditions are also attractive: academics have to teach a minimum of 3 courses, implying 6 contact hours per week or 192 contact hours over the 32-week academic year (compared with 12 contact hours per week for professor at PAAET and 18 contact hours per week and 550 hours in total per year in so-called "post-1992" universities in the United Kingdom).[16] KU academics who were granted a scholarship by KU also benefit from a year at each rank (including a year on full pay), at intervals of six years or more. A Scientific leave is also available to Kuwaiti and non-Kuwaiti faculty.[17]

KU uses conventional academic promotion criteria in addition to the other requirements: the staff member's contribution to teaching, research, and to university and community service. Promotion to a higher rank requires the production of articles in refereed journals (five for associate professor and ten for full professor).

Once promoted, there is no obligation for publishing or submitting a research project, but the university has recently established a set of financial incentives: KWD 1 000 (about USD 3 300) are provided to authors for publications in highly cited (Q1) journals. An incentive of up to KWD 4 000 (about USD 13 200) is awarded to researchers for each funded project when its results are published in a Q1 journal. Individual cash bonuses for high-tier publications have been introduced in China, Korea and Turkey, and while they have demonstrated its potential for boosting submissions to high-tier journals by about 46%, they did not result in any significant increase of actual publications in those journals, resulting notably in unnecessary overload of peer reviewers in those journals. Enhancing actual publications is much more effective through career advancement incentives (+34%) and institutional incentives (+21%) (Franzoni, Scellato and Stephan, 2011). Although no evidence could be collected on this as part of this review, some interviewees

mentioned some detrimental "non-merit based" practices regarding staff recruitment and promotion, notably favouritism based on social networks and interpersonal relationships. Such practices are not confined to KU but more pervasive in Kuwait. The aforementioned study on HEIs in Kuwait highlighted the role of *deawaniat*, i.e. weekly gatherings of social networks, in recruitment and advancements (Al-Mutairi, Naser and Al-Enezi, 2017).

KU's student-to-staff ratio is at the unfavourable end of the range seen internationally, with one academic staff member for 24 students. Other universities in the region listed in the world rankings have rather fewer. Universities at the very top of the rankings (and which are very research-intensive) such as Oxford, Cambridge, UCL, Harvard and Princeton often have around ten students per staff member. Strong but less exalted and more teaching-orientated universities such as Manchester, Durham and many of the US state colleges may have a ratio of 15:1. The top 100 universities with the best student-to-staff ratio all have less than eight students per member of staff, including King Saud bin Abdulaziz University for Health Sciences and King Abdulaziz University (both in Saudi Arabia) as well as Khalifa University (United Arab Emirates) (THE World University Rankings, 2019).

Research activities

The Kuwait Research Review Panel (KRRP) report provides a useful baseline for research at KU in 2005. It stressed that research was focused primarily in the Colleges of Science, Engineering and Medicine. It was fragmented and hampered by bureaucratic funding processes. University appointments were made based on teaching, not research, needs and doing research afforded faculty members few benefits. Teaching loads were said to be heavy and those engaged in research had to do so without any reduction in teaching. On the basis of this diagnostic, the KRRP made several recommendations to improve research and innovation performance. These include the development of a strategic plan for research; the improvement of linkages with other research-performing institutions in the GCC and beyond; the creation of centres of excellence for interdisciplinary work and teaching; an increase of internal and external research funding; the creation of incentives and the removal of barriers to faculty participation in research by reducing bureaucracy and teaching loads and employing more research assistants; the enhancement of collaboration with industry by setting-up outreach offices at departmental level. While several actions in line with these recommendations have been taken in recent years, results are still below expectations, and even worsening in certain critical aspects related to research.

Research activities are mainly performed by faculty members, as there are few PhD students, in particular in hard science (72 in 2018/19)[18], and almost no post-doctoral researchers (between two and four during the period 2013-17). This is a problem because in most university systems, the PhD students and post-docs do the "foot-work" of research. Without them, it is difficult for permanent faculty members to be productive, especially in the "hard" sciences. The number of non-teaching researchers is also very low, less than ten for the entire university during the period 2013-17.

According to KU rules, academics should devote 40% of their time to teaching, 30% to research, and 30% to outreach and community service. Although it is hard to assess precisely, available statistics on the proportion of faculty members publishing or involved in research projects, supported by interviews at KU, tend to indicate that not all academics engage in research as much as they are formally expected to (i.e. below the 30% requirement). On average, about one-quarter of faculty members produce an indexed publication per year (21% in 2017/18) based on KU's internal monitoring data.[19] These numbers are below what can be found, for instance, in terms of time dedicated to research (US faculty dedicated about 50% of their time to research in 2005) and proportion of faculty involved in research (between 45% and 97% of EU faculty are involved in research).[20] In Portugal, in 2015, 75% of teaching staff in public universities were formally integrated in a research team (OECD, 2019[127]).

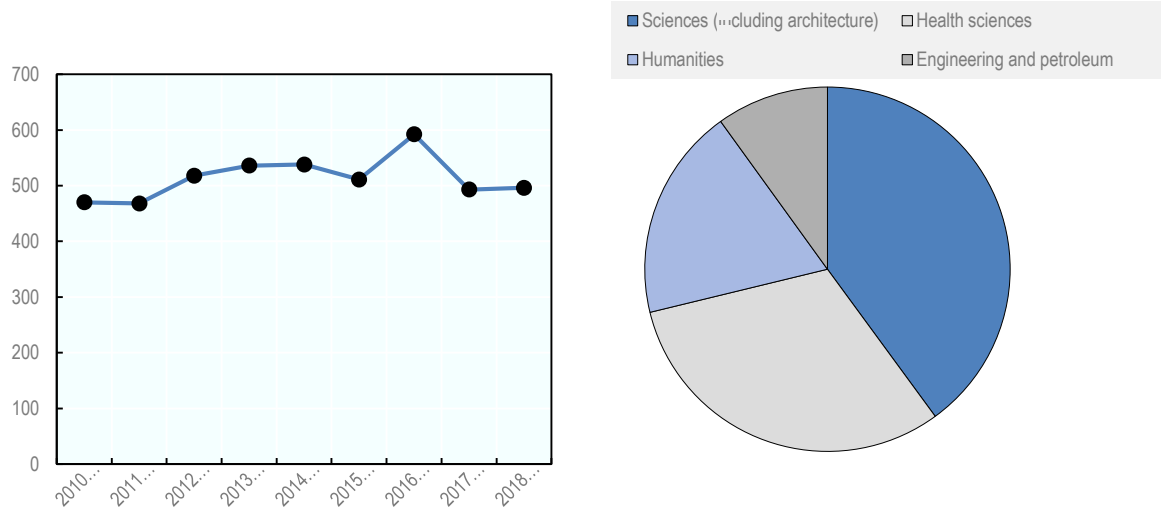
According to KU management, the involvement of faculty members in research has been hindered by the change in teaching load above 2 or 3 classes per term in 2010, with a financial reward that made the research funding financial grant less attractive.

The number of research projects is also indicative of the level of research activity at KU. All in all, there were 496 ongoing or completed, internally or externally funded, research projects in 2018/19. Most of them were in the science (37%) and health (29%) areas. It is particularly striking that the number of funded projects has been relatively stable since 2010, despite the budget volatility (Figure 4.7). This tends to indicate that the average budget of projects decreased due to the reduction of the overall research sector budget.

Most of these projects (416 projects, 84%, in 2018/19) receive funding from an internal grant scheme to which researchers can apply since 1985 (Figure 4.7). Other projects are funded externally (73 projects funded by KFAS alone). Proposals to the internal scheme are reviewed by one to three peers, depending on the size of the grant, the larger projects (above KWD 10 000) are reviewed by three external peers. However, most projects are small: of the 592 projects ongoing or completed in 2016/17, 60% had a budget of KWD 4 000 or less and only 33% had a cost of more than KWD 10 000 (KU, 2018). The largest projects are those that are awarded for research units and laboratories and projects jointly sponsored with KFAS, in the health area for the most part, as well as other specific projects related to KFAS programmes.[21]

About 130 grants are allocated per year, which indicates that most projects – even the small ones – last for several years and therefore the level of activities is low and spread over three to four years. The number of publications stemming from funded research is also modest. During the year 2018, the 493 projects (355 ongoing and 141 completed during the year) generated 127 publications, including 52 in Q1 journals and 36 in Q2 journals.[22]

Figure 4.7. Number of research projects at Kuwait University, breakdown by themes, 2017-18 and per year 2010/11-2018/19



Source: Kuwait University website, Office of the Vice-President of Research, www.ovpr.ku.edu.kw/index.php/en.

Higher education activities

KU had 38 526 registered students in 2017/18, having graduated 7 435 the year before. Some 94% are undergraduates and 6% are enrolled in a Master's degree. Of the 2 239 graduate students, 72 are working on PhDs (Table 4.6).

Table 4.6. Students enrolled at Kuwait University by discipline and degree, 2017/18

Discipline	Bachelor's		Master's		PhD	Percentage of total student population
Natural sciences	3 999	11%	200	9%	5	7%
Engineering and technology	4 813	13%	428	20%	0	0%
Medical and health sciences	2 165	6%	63	3%	19	26%
Social sciences	14 357	40%	856	40%	0	0%
Humanities	10 953	30%	399	18%	48	67%
Others (joint disciplines)	0	0%	221	10%	0	0%
Total	36 287	100%	2 167	100%	72	100%
Percentage of total student population	94%		6%		0.2%	

Note: The number of PhD students only include those registered at KU graduate College (hence excluding those registered at PAEET or KISR scholarship programs).
Source: Data provided by Kuwait University.

According to data provided by KU, most Kuwaiti PhDs (445 in 2017) at KU are hosted in foreign institutions, mainly in the United States (285) and in the United Kingdom (72).[23] This is a condition for being able to find a position at KU on their return to Kuwait. For comparison, some 4.3% of the UK student population is doing a PhD in 2017/18.[24] This compares with 0.2% at KU. Even when adding KU's PhDs hosted abroad, the ratio is only 1.3%. In the absence of precise statistics, we can estimate the number of doctoral graduates at 80-100 annually,[25] or about 0.07-0.09% of the relevant age cohort. This places Kuwait among the countries with the least doctoral graduates, well below the OECD average (1.6%). Some other PhDs hosted by PAEET and KISR are not included in the calculation but their number is not large enough to significantly change this assessment.

Roughly 85% of the students are Kuwaitis. KU has a 15% maximum for non-Kuwaiti enrolments at first-level university degrees, but accepts a higher proportion of non-Kuwaitis for post-graduate degrees.

KU has two semesters per year, starting in September and January, each of 15-17 weeks duration. Optional summer courses are provided during an additional eight-week period (similar to that at mainstream US and UK universities, but leading universities such as Oxford and Cambridge have a 24-week year). Class sizes are said to have grown in many cases to exceed agreed limits, as a result of a decision by the ministry to increase student numbers by 2 000 without increasing faculty numbers.

KU's teaching activities are dominated by the social sciences and humanities (70% of students). In line with the prominence of social science and humanity studies in the university, the 6 905 students graduated have mainly found positions in law, administration, education and social services: 540 were hired as lawyers, 583 as social scientists, 2 017 as educators, 634 as administrators, and 1 049 as *sharia* and Islamic experts. Of graduates, 834 became engineers; 150 doctors, pharmacists and dentists; 210 health life sciences personnel; and 236 scientists (KU, 2018).

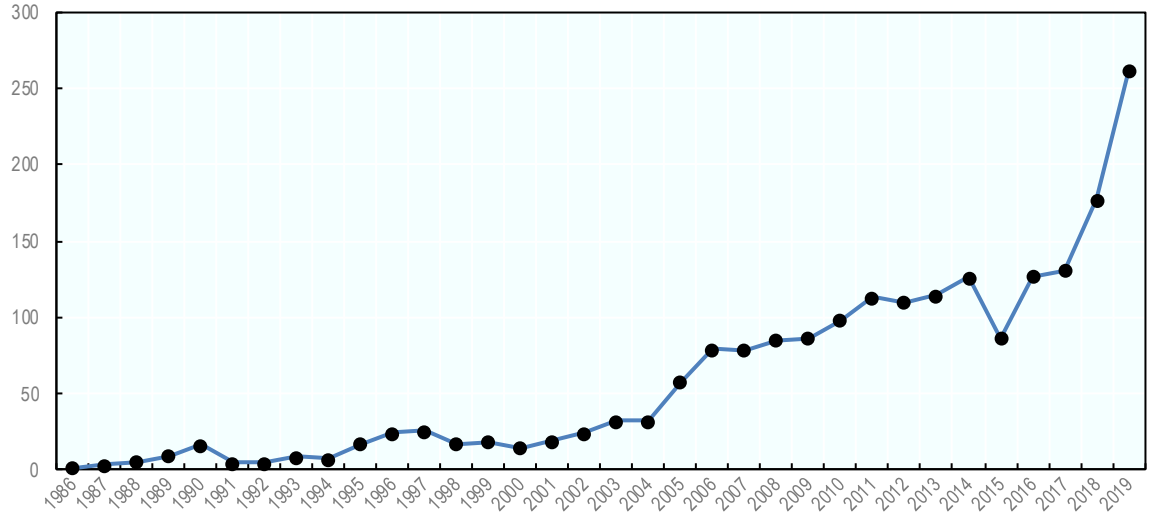
4.2.2. The Public Authority for Applied Education and Training (PAAET)

The PAAET is the equivalent of what would be called a "technical university" or "polytechnic" in many countries having a dual higher education system. It was set up in 1982 to provide a three-year undergraduate applied education (associate and bachelor degrees, for instance in nursing) and shorter vocational training courses. It aims to educate and train the national workforce in order to endogenously promote the skill-based development of the country. One key objective, reiterated in several documents, is to "rebalance the national labour market": given the dominance of expatriate labour in the private sector, PAEET was established to train Kuwaitis to be able to take over some of their roles.

PAEET's research performance

Little information is available on PAEET's research outputs. Figure 4.8 shows that PAAET effectively began to publish in the scientific literature in the early 2000s, with its production recently starting to exceed 100 publications per year.

Figure 4.8. PAAET publications in Scopus per year, 1986-2018



Source: Scopus database, https://www.scopus.com/search/form.uri?display=basic (accessed on 10 January 2020).

PAAET's scientific publications focus on mainstream "hard" sciences and engineering (engineering alone accounts for about 18% of publications). In many subjects, the rate of output has not changed much over time. However, it has declined significantly in environment, chemistry and nursing while increasing substantially in physics, computer and social sciences.

PAAET's international co-publications are less US-focused than those of KU. The main partners during the period 2017-19 were Iran, Saudi Arabia, China, Viet Nam and Australia. In the period since 2008/10, Oman has declined in importance to be a very small partner, while Saudi Arabia, Malaysia and Pakistan have become much more important than before.

Governance, strategy and funding

PAEET is headed by a director general and governed by a board of directors. The board of directors:[26]

- develops plans and programmes of applied education and training and follows up on their implementation;
- proposes draft laws and decrees related to its competence;
- establishes, abolishes or merges applied education institutes and training centres;
- sets the conditions for admission to these institutes and centres and the system and programmes of study and duration, scientific degrees and certificates granted, and the adoption of the results of final exams;
- determines the financial rewards that may be granted to learners and trainees in these institutes and centres and the conditions for obtaining them;
- sets financial and administrative regulations, appointment and promotion provisions, and salary systems within the Civil Service Law;

- approves the draft budget and final account before submitting it to the competent authorities;
- decides on scholarships and study leave for the authority's staff, students and trainees in its institutes and centres;
- interacts with public authorities and other institutions to identify the needs of the labour market while maintaining its autonomy in terms of the provision of education and training.

PAEET's budget amounted to KWD 302.8 million in 2017/18. Total expenditures were KWD 280.2 million.

The total approved budget for ongoing research projects was KWD 747 000, technological studies and basic education colleges accounting for about 75% of the research carried out. KFAS financed ten of these projects, accounting for 24% of the approved budget (KWD 181 000) (PAEET, 2019a). Total research expenditures in 2018/19 amounted to KWD 152 810, of which KWD 42 778 was funded by KFAS (PAEET, 2019b). According to these figures, research accounts for about 0.06% of PAEET's total annual expenditures.

Higher education activities

In 2007, the PAAET was comprised of six colleges of applied education and eight training institutes (Table 4.7).

The PAAET had about 50 000 students in 2017/18, including about a fifth in the training institutes. It runs four main educational colleges and eight training institutes.[27] Its colleges offer three-year diplomas and teaching certificates while the training provided by the training institutes tends to be of shorter duration. The PAAET also provides custom short courses for various ministries or large state-owned companies like the KOC. Almost all students are Kuwaitis and only a few scholarships are awarded to non-Kuwaitis.

Table 4.7. PAEET student enrolment 2017/18

Sector	College and training institutes	Number of students and trainees	%
Applied education and research sector	Faculty of Basic Education	22 395	57%
	Faculty of Business Studies	8 556	22%
	College of Technological Studies	6 108	16%
	Faculty of Health Sciences	1 488	4%
	College of Nursing	609	2%
Total applied education and research sector		39 156	*100%*
Training sector	Higher Institute of Communications and Navigation	1 500	13%
	Higher Institute of Energy	920	8%
	Industrial Training Institute – Shuwaikh	1 065	9%
	Industrial Training Institute – Sabah Al-Salem	953	8%
	Nursing Institute	736	7%
	Construction Training Institute	1 099	10%
	Vocational Training Institute	509	5%
	Higher Institute for Administrative Services	3 201	28%
	Institute of Tourism, Beauty and Fashion	14	0%
	Introductory training courses	653	6%
	Special courses average	659	6%
Total training sector		11 309	*100%*
Total		**50 465**	

Source: Information provided by PAEET.

There is no PAAET-wide strategy for knowledge development and the connection to Kuwait's development strategy is disaggregated. Each college and institute is expected to research the requirements of the

relevant job markets (assisted by industry advisory committees) and adjust the number and type of places they provide accordingly. This, or a lack of student demand, means that some courses may be suspended periodically. The most formal channel between PAEET's provision of higher education services and national priorities consists of its participation in the newly established Higher Committee on Labour Market under the aegis of the General Secretariat of the Supreme Council for Planning and Development (SCPD).

There is no relevant skill or qualification framework to structure PAEET's provision of education and training. The national qualification framework dates back to 2003 and has not been updated since then, despite major changes of job market requirements, in relation to the digital revolution, for instance. New national skills standards were developed in 2017, but are not yet being implemented.

While the number of trainees in institutes has been somewhat stable in recent years, the number of students is growing, from 35 434 in 2014/15 to 39 156 in 2017/18. PAEET faces the double challenge of having to accept all graduated students – sometimes as a "higher education institution of last resort" – while having difficulties to attract national students in some key areas such as nursing. More generally, PAEET is impeded in its mission to provide a national workforce for the private sector since most students opt for the privileged conditions of a job in the government sector, to which they are legally entitled. In a sector like construction, for instance, only about 7% of students went for a job outside the government sector. In order to at least partially offset this unbalanced labour market, PAEET provides incentives ("specialisation" and "excellence" bonuses) to students who accept to join certain disciplines where new competencies are most needed. In 2017/18, 6 119 students and trainees received a "specialisation" bonus and 2 876 an "excellence" bonus.

Staff

PAEET had 4 658 staff in 2017/18, including 373 non-Kuwaitis and 4 285 Kuwaitis. There were 3 003 teaching or training staff and 1 655 administrative staff. Among the 1 527 teaching staff, 316 were professors or co-professors and 1 211 assistant professors, lecturers or teachers. There were 1 476 trainers. Of the total staff, 2 542 fell under the "special cadre" status and 2 116 were "general staff".[28]

PAEET's staff is well qualified, with 39% holding a PhD. The PhD-holders were strongly concentrated in basic education (61%), with other colleges having 25% or fewer PhDs (KRRP, 2007).

PAEET's staff-to-student ratio is similar to that of KU, with about 26 students per academic staff member. As expected, this ratio is far lower in institutes, with a ratio of staff-to-trainees around 8.

Research activities

Initially, the PAAET was not mandated to do research, but by the time of the KRRP report, it was doing some research in order to develop staff capabilities and support scientific innovation (KRRP, 2007). Research at PAEET remains a secondary and informal mission, not mentioned in PAEET Law. However, in practice, it is becoming more prominent. The institution has established new processes, such as, for instance, financial incentives for publications and research-based promotion mechanisms. Publication has become one of the criteria for promotion within the PAAET and financial incentives are offered to authors who publish in impact-factor journals.

PAAET research projects may be done either with internal or with KFAS external funding (though the institutional funding budget is only of the order of KWD 100 000). In both cases, applications are processed by a research office in the central administration. The Environmental Protection Agency and KFAS are its main external research funders.

In 2007, PAEET was engaged in about 230 research projects, about half of which were funded internally (47%), with the balance almost equally divided between the Environmental Protection Agency and KFAS. These projects were small (in the range of KWD 5 000-8 000 per project) and took a long time to complete.

In 2018/19, PAEET reported 128 projects, 27 of which were completed during the year. As for KU, a dedicated commission selects the projects to be internally funded (PAEET, 2019b).

Publication data (doubling the number of publications per year between 2007 and 2017) and interviews suggest that research activities have increased significantly in the last ten years, but there are no comprehensive and recent data available.

Instructors are expected to provide up to 12 hours of teaching per week. They can apply for up to an additional four hours of teaching in return for increased pay. However, there is no reduction in teaching hours or increase in pay provided to those who do research in addition to teaching.

The PAAET's vocational courses operate against the background of a national qualifications framework developed in 2003. This was updated into a new set of National Skills Standards in 2016, but according to the PAAET, this has not been implemented.

4.2.3. Private universities

Reflection on the establishment of private universities in Kuwait started mainly in the second half of the 1990s. These institutions were seen as serving different needs that were becoming more pressing: responding in a cost-effective manner to the growing number of students entering higher education, in line with the willingness to support the knowledge-based development of the country; the provision of vocational education that would help reduce the number of Kuwaiti students studying abroad. According to Al-Saadi (2015), one early motivation was to also to open avenues for education of the children of expatriate workers. More generally, the overall aim of private universities has evolved since they were first allowed to operate in Kuwait, from a purely quantitative to a more qualitative role: while they were simply expected to add capacity to the higher education system, they are now valued for opening the range of educational options to students, teaching and training specialties that are not offered by KU or PAEET, and opening new channels for interaction with foreign university partners.

Governance, strategy and funding

The private university and college sector is regulated by the Private Universities Council of Kuwait (PUC), created in 2000. The PUC is headed by the Minister of Higher Education and has eight members. It accredits universities and new courses, approves the appointment of new academics, approves fee levels set by the universities and monitors the quality of activities performed by universities, using international quality assurance and accreditation standards.

Private universities are funded by their private partners and tuition fees. They are also partly and indirectly funded, since the PUC provides internal scholarships for students to about 4 000 students annually.

The PUC also serves as a liaison between the government and the private institutions in order to better orientate private universities towards the national needs and priorities. However, the PUC receives little guidance from the SCPD as to where to develop future capacity and is left to determine, together with the private universities, what the future needs of the labour market will be.

Higher education activities

The sector is young and fragmented into many, mostly small, organisations. The more important ones are foreign. These institutions fall clearly into two groups:

- Universities offering bachelor's degree courses (none offers a higher degree). These implicitly compete with KU.
- Colleges providing two-year diplomas and shorter training courses. These implicitly compete with the PAAET.

The total number of students enrolled in private universities was about 25 000 in 2019 (about 10 000 in 2006/07). Table 4.8 provides an overview of the private universities' landscape.

Table 4.8. Foreign and private universities and colleges in Kuwait

Name	Year established	Faculty	Students	Observations
Bachelor degree level universities				
American University of the Middle East	2008	10 415	8,000	Partner: Purdue
American University of Kuwait	2003	85 in 2011	1 260 in 2010/11	Locally owned, for-profit liberal arts institution Partner: Dartmouth College in Hanover, New Hampshire
Arab Open University	2001			Based on UK OU
Australian College of Kuwait[1]	2002	163	3 098[1]	ACK offers Diploma and Bachelor degrees that are endorsed by its Strategic Partner CQUniversity Australia
Gulf University of Science and Technology	2002	160	3 700	Partners: University of Missouri and University of Calgary
Kuwait College of Science and Technology	2015	51		Start-up phase
Kuwait International Law School	2009	40		
Diploma level colleges				
Algonquin College Kuwai[1]	2015	15	217	Diplomas
American University of Kuwait[1]	2013	114	2 500	Sub-degree courses
American College of the Middle East	2009			Two-year diplomas
Box-Hill College Kuwait	2007			Women only. Two-year diplomas Branch of Box Hill College in Melbourne
College of Aviation Technology	2009			Two-year diplomas – aircraft maintenance
Kuwait Technical College	2014			Two-year and industry IT diplomas
Kuwait Maastricht Business School	2003			MBA, DBA degree Branch of Maastricht School of Business in the Netherlands

1. Information provided by the college/university.
Sources: (KFAS, 2017a); websites of the universities.

Most private universities are governed by a board of trustees comprised of both local and international members representing higher education and corporate industries.[29]

The government has encouraged the establishment of foreign universities by providing land, supporting the development of their infrastructure and providing scholarships to students. However, the highest status international universities do not set up in Kuwait, but elsewhere in the Gulf. A large proportion of the students attend thanks to scholarships from the Kuwaiti government (in the case of the American University, this is about half the students). These universities tend to focus on a small number of subjects – especially ICT and computing. Many offer a foundation year, intended to close the gap between the attainment levels typical of Kuwaiti schools and entrance needs for university.

The majority of the teachers in the foreign universities and colleges are expatriates, typically on fairly short (two- to three-year) contracts because of uncertainties about whether the government will continue funding the student scholarships. Expatriates also risk deportation if complaints are made against them. There is no tenure track. In principle, the universities and colleges could offer longer-term contracts, but there is uncertainty about whether the government will continue to provide the scholarships on which a large part of their market depends.

Research activities

At present, these institutions provide marginal capacity to the domestic Kuwaiti higher education system, particularly in business and IT-related subjects, and have a limited – but growing – research capacity.

While most of these universities are still only developing their research agenda and pilot infrastructure (Al-Saadi, 2015), some of them have developed their research capacity and made significant efforts to develop and integrate research with their teaching activities. Although, as for KU, these universities have no non-teaching researchers, most faculty members hold a PhD in some of them (for instance, 84% of the 114 faculty members at the American University of Kuwait have a PhD).

A growing number of these universities are doing some research, and those which do are able to receive KFAS research grants in competition with Kuwaiti organisations such as KISR and KU. KCST for instance, although only created in 2015, already has a significant track record. It submitted 59 applications to KFAS, of which 21 were selected for funding. It also carried out 33 externally funded research projects.

The joint undertaking of research projects – along with other forms of collaboration and exchange – is part of the requirements that the PUC has established for the accreditation of private universities. A research and development committee at the PUC oversees the development of these activities. While modest and concentrated in only a few of them, the number of publications from these private institutions reveals that some of them are active in research (see Table 4.9).

Table 4.9. Number of publications of research-active private universities and colleges in Kuwait, 2010-18

Name	Number of publications
American University of the Middle East	636
Gulf University of Science and Technology	595
American University of Kuwait	324
Australian College of Kuwait	277
Kuwait College of Science and Technolog[1]	193
Arab Open University	153

1. Since 2016 only.
Sources: Scopus.

Those that are the most active in research have developed processes (including some still-minimal internal and external funding capacity) and infrastructure to promote their research activities. For instance, the American University of the Middle East (AUM) has developed a research centre (AUM Research) focused on providing opportunities for students and faculty to engage in research, and to further and encourage critical thinking and problem-based learning. ACK also established a research centre in 2016 to act as a hub where all research-related activities will be managed and supervised. Also, ACK has established relevant policies and procedures, research fund, and research incentives to foster research among ACK faculty members. It has also very recently established a Nanotechnology Research Centre, with the support of Purdue University (United States). The Gulf University for Science and Technology has a dedicated research and development office to facilitate research activities within the university and a University Research Foundation to help faculty undertake pilot projects for exploratory research projects. It provides funding and/or matches the costs associated with external funds obtained. The Australian College of Kuwait also undertakes a variety of research activities, with international, as well as national, partners such as KISR and KFAS (Box 4.5);

Box 4.5. The Australian College of Kuwait

The Australian College of Kuwait (ACK) was established in 2004 with the mission "*to deliver quality higher education and training, both theoretical and experiential, in engineering and business through a learning environment that is respectful, supportive and safe, in which innovation and lifelong learning by students are fostered"*.

In 2019/20, 3 098 students were registered at the ACK. The college has 74 faculty members (most of them being non-Kuwaitis). 19 of them are professors or associate professors; 55 are assistant professors. All full, associate or assistant professors hold a PhD.

The board of trustees is its highest authority, setting its general policies and controlling their execution, including the supervision of its academic and research works as well as other matters related to its activities. The college has expanded and formalised its research activity in recent years. It has established a Research Fund (to fund internal research project), a Scientific Research Council in 2016 (to oversee, organise and promote research and research-related activities), a forum for faculty to submit individual and joint research proposals for funding and support, and formed a joint Research Committee with Central Queensland University (35 000 students in Australia) for research collaboration and capacity building (a number of shared projects are ongoing). It also has a Research Policy and a Research Strategy Plan. Its research is, for the most part, of applied nature and conducted in close interaction with the ACK's Industrial Advisory Board in order to support faculty members to develop research projects in co-operation with industry.

In line with these developments, the college has increased its budget dedicated to scientific research and related staff development in recent years. Furthermore, the ACK is closely collaborating with the PUC for the establishment of a Kuwait-based scientific journal. The ACK signed a memorandum of understanding for research collaboration in 2017 with KISR, and a co-operation agreement for data sharing with KFAS in 2018.

During the year 2017/18, 108 project applications were developed: 7 joint research proposals with Central Queensland University; 29 internal research grant applications and 72 KFAS research grant applications.

Of the 33 faculty recruited in 2016/17, 58% held a PhD. Promotion criteria for assistant, associate and full professor ranks include research-related achievements, in particular, evidence of high-quality, peer-reviewed research publications, and significant research grant funding and/or awards.

In 2016/17, ACK faculty published 68 articles, 46 of which were in Q1-Q4 journals (28 in Q1 journals). Since 2010, the number of publications amount to 222 papers (28 in Q1 journals).

The college also has a number of initiatives to support innovation and entrepreneurship, such as boot camps, a New Product Launch Competition, a Competition for Innovation and Entrepreneurship in SMEs and, of course, a number of entrepreneurship and problem-based learning courses and events.

Sources: ACK (2018b), Faculty Research Output 2016/2017; ACK (2018a), ACK Annual Report for the Academic Year (2016/2017); ACK human resource information provided by the ACK.

4.3. Research institutes

4.3.1. The Kuwait Institute for Scientific Research

The Kuwait Institute for Scientific Research (KISR) was established in 1967 by the Arabian Oil Company Limited (Japan) in fulfilment of its obligations under an oil concession agreement with the government of Kuwait. The institute was established to carry out applied scientific research in three fields: petroleum, desert agriculture and marine biology. It has since then expanded and grown mainly in response to demands from various public authorities in charge of other areas. For many years, KISR was the only research-performing institution in Kuwait, and it is still the largest.

KISR's overall performance

An external evaluation of KISR's Fourth Strategic Programme (1995-2000) stated that while research quality was adequate in most parts of the organisation (and strong in a few), international linkages were inadequate. Productivity and morale were low. Parts of the organisation were critically dependent upon expatriate skills and the Kuwaitisation process put these areas at risk. Project management was assessed as generally insufficient. Sales and marketing were bureaucratic and failing to adequately to engage with customers, especially in the private sector, or to provide timely proposals or results. Low levels of absorptive capacity and budget for research were major obstacles among both public and private sector customers. The lack of an overall STI policy hampered KISR's efforts to devise its own strategy and maintain a division of labour with others doing research in Kuwait (Arnold et al., 1999).

While acknowledging the value of many of the technical areas and projects on which KISR worked, the KRRP (KRRP, 2007) also offered strong criticisms of KISR in 2007, pointing to:

- ambiguity in strategic direction and measurable performance objectives;
- lack of experienced and dynamic managerial leadership;
- lack of high-performance management systems;
- inadequate staff management, exacerbated by the process of Kuwaitisation that tended to deprive KISR of expertise and meant a complete absence of non-Kuwaitis in leadership positions;
- lack of competitiveness in regional and world markets;
- inadequate ministry oversight, so that KISR effectively determined its own agenda, independently of government.

The report pointedly set out recruitment criteria for future directors- and deputy directors-general based on quality and experience, saying that non-Kuwaiti as well as Kuwaiti candidates should be considered.

No evaluation or review of KISR in recent years provides an updated overview of KISR's current performance. The interviews performed with KISR and its main partners as part of this OECD review tend to show that despite significant internal reforms and an increase of the scale and scope of research activities, some of the issues listed above are still hindering KISR's ability to deliver on its mission, in particular with regards to research commercialisation. Most of the recent data originating from the institute's monitoring system support this claim. The number of publications has remained stable in recent years (as accounted for in the institute's monitoring system), the numbers of research projects (and contracted projects) have increased significantly. However, the number of patents granted remains limited (eight in 2017/18 and 2016/17), although it has increased in recent years. Hence, despite significant efforts, there has not been any major improvement in the field of research commercialisation in recent years, partly due to the fact that KISR still operates in a challenging environment.

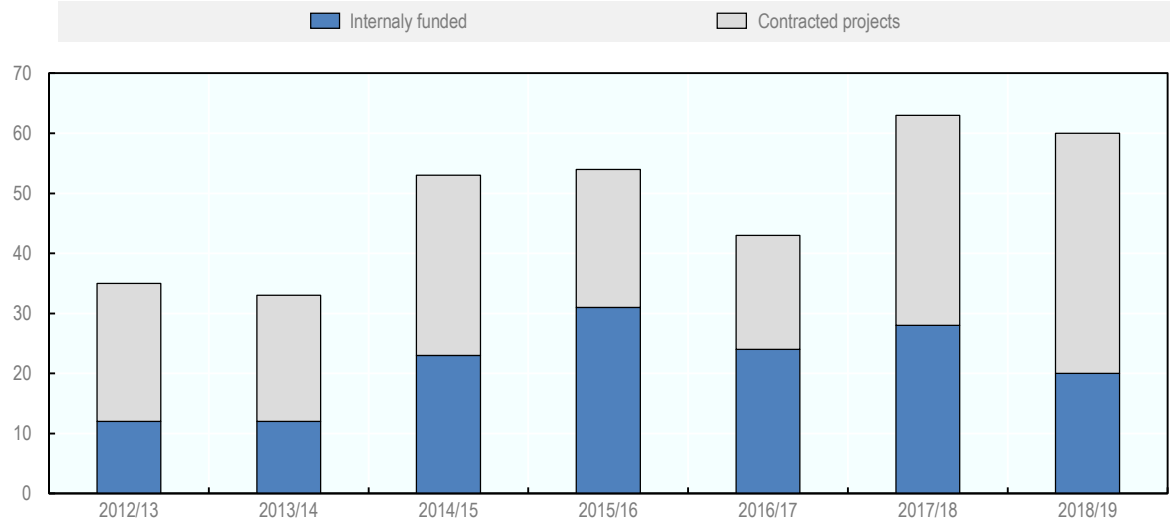
This report is not an evaluation of any specific Kuwaiti institution, not even one that account for almost all the national applied research capacity. The mixed performance highlighted above finds in great part its

roots in the environment in which KISR operates, notably a very small private sector, limited innovation awareness and capabilities of potential public clients, a small research and innovation budget (in proportion of the country's GDP) and the absence of a dedicated national innovation policy to steer a collective effort in this area.

KISR's research performance

KISR completed 60 projects in 2018/19, a significant increase since 2012/13 (30 projects). The number of contracted projects has more than doubled between 2016/17 and 2018/19 (Figure 4.9). The majority (67% in 2018/19) were at least partially funded by an external partner (KFAS and the KOC account for the bulk of these projects). The Environment and Life Sciences Research Centre accounts for 19 projects and the Energy and Building Research Centre for 11, the Petroleum Research Centre for 8 projects. Four projects were carried out by the Water Research Centre. However, KISR external income remains due to small and in-kind contributions of clients.

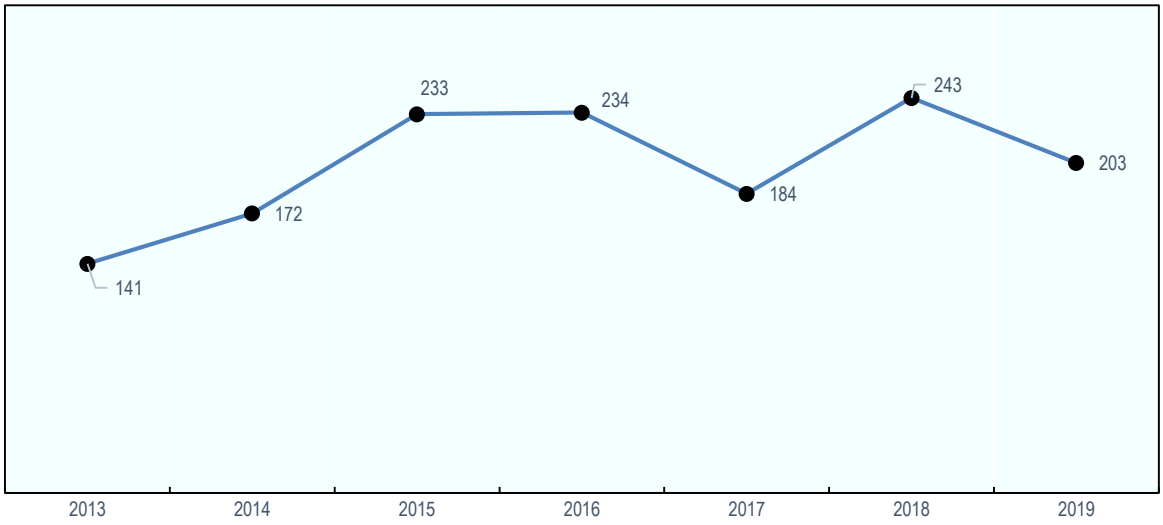
Figure 4.9. KISR's internally funded and externally contracted projects (number of projects)



Source: Data provided by KISR.

KISR's mission is, essentially, to carry out applied research for sustainable economic and social development. Hence, producing scientific publications plays only a subordinate role it its work. Given its size, it is nonetheless one of the biggest producers of scientific papers in Kuwait. According to KISR's own monitoring of publications, the number of publications has remained rather stable in recent years, following a significant increase from 2013 to 2015 (Figure 4.10).[30]

Figure 4.10. KISR's publications in its internal monitoring system, 2013-18



Source: Data provided by KISR.

KISR's own account of its publication between 2010 and 2017 (Table 4.10) indicates that these are biased towards Q1 journals, suggesting that while its overall production of scientific papers per year is modest in relation to the number of researchers, the quality of what is published is relatively good, with good representation in the highest quartile (KISR, 2015).

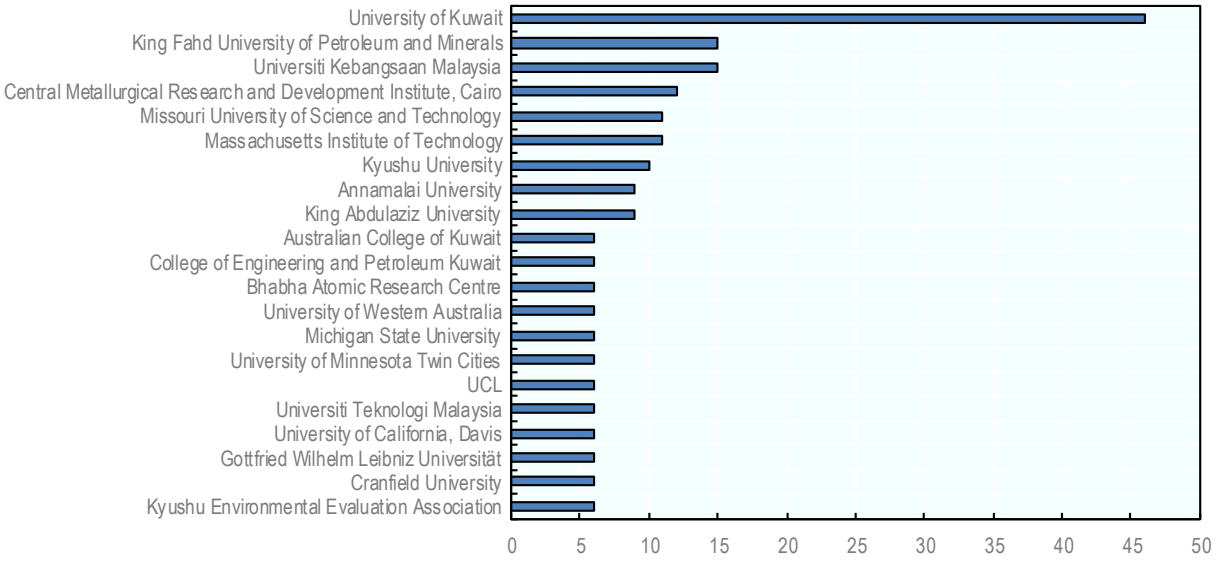
Table 4.10. KISR's indexed publications by quartile, 2010-17

Quartile	Number of publications	% of total publications	% of indexed publications
Indexed Q1	108	32%	50%
Indexed Q2	49	15%	22%
Indexed Q3	49	15%	22%
Indexed Q4	12	4%	6%
Not indexed	116	35%	–
	334	100%	100%

Source: KISR (2015), 8th Strategic Plan: 2015-2020.

KU was KISR's main co-publication partner during the period 2017-19, but represents a low proportion of the total co-publications (Figure 4.11). Otherwise, it has research contacts with a good number of international universities. This translates into a wide and increasing array of countries with which KISR co-publishes, with the United States dominating, followed by Malaysia and the United Kingdom. The institute also co-publishes with a good mixture of countries from the Gulf, the developing and the developed world. KISR had co-publications with 43 other countries in 2008-10, growing to 119 in 2015-17. Compared with 2008-10, Malaysia, Saudi Arabia and Japan have become much more significant co-publication partners in the more recent period. Both the United States and the United Kingdom have been among the main co-publication partners across the whole period.

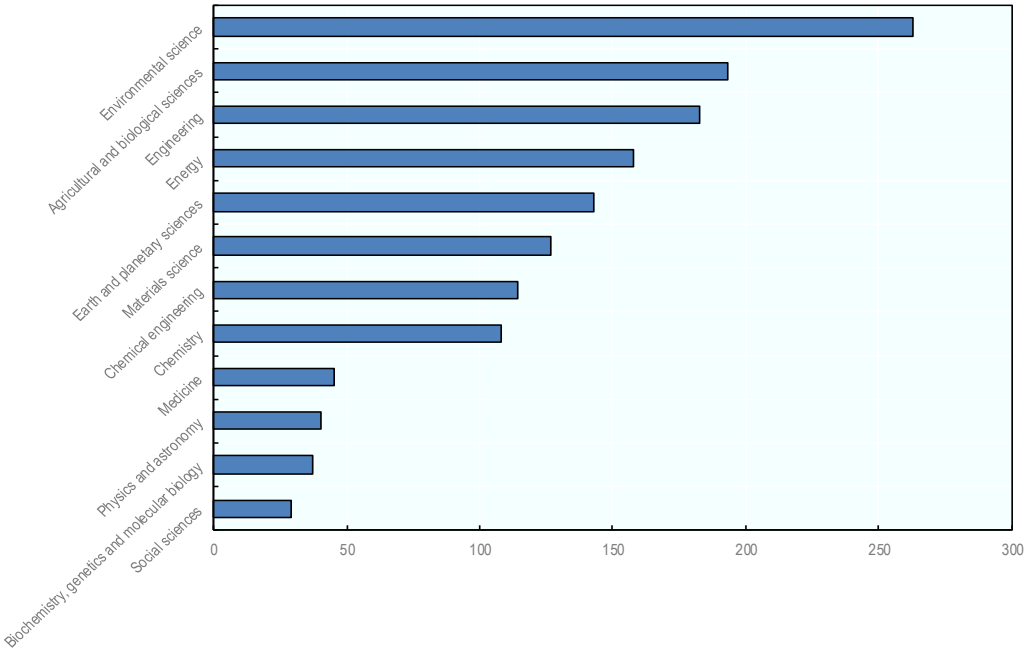
Figure 4.11. KISR's co-publication partners, 2017-19



Source: Scopus database, https://www.scopus.com/search/form.uri?display=basic (accessed on 10 January 2020).

During the period 2017-19, KISR published mainly in environmental science (18%), agricultural and biological sciences (12%), engineering and earth science (11%), planetary sciences (10%), and energy[31] (9%) (Figure 4.12). The way KISR's scientific production is distributed across subjects has mostly remained stable since 2008, though with a substantial drop in computer science and more modest percentage increases in chemistry and energy.

Figure 4.12. Breakdown of KISR's scientific publications by subject area, 2017-19



Source: Scopus database, https://www.scopus.com/search/form.uri?display=basic (accessed on 10 January 2020).

As any other applied research institute, KISR's main role is not to produce publications, but to support the technological development of Kuwait, in line with the national development strategy. No single indicator can shed light upon the performance of KISR in that respect and such assessment, which does not fall under the scope of this review, should be conducted in each thematic area. Box 4.6 provides an overview of the achievements in one of the areas in which KISR is relatively strong and which is a priority for Kuwait: water desalination technologies. This overview includes an identification of the main external and internal factors that support or hinder KISR's accomplishments in this area. Recently, KISR and the Ministry of Electricity and Water have started a new co-operation, which contrasts with earlier – more linear – traditional practices. A public servant is now assigned to work with KISR from the beginning of a research project so that s/he can learn about the merits and challenges of the new desalination technologies and help make the case for them within the ministry. This new practice might help alleviate some of the hurdles faced by KISR in its co-operative activities, in the desalination area but also in other fields where it could be replicated.

Box 4.6. KISR's achievements in the area of water desalination

Due to its challenging geographic and weather conditions, the supply and management of fresh water for various usages in Kuwait are of major importance for its economic and social development. The increasing demand for water (overall and per capita) calls for large investments and more efficient solutions. The share of water production by desalination in Kuwait currently exceeds 90%. The most commonly used desalination technologies are based on distillation processes, in particular the multi-stage flash distillation technology (MSF). However, most new desalination plants now use reverse osmosis (RO) membrane technologies. It is proven to be significantly less energy-intensive than conventional MSF and currently represents more than 60% of all installed capacity worldwide. The first commercial desalination plants using RO were inaugurated in California in 1965 (brackish water) and 1974 (sea water). The biggest desalination plants are in the United Arab Emirates, Saudi Arabia and Israel. In Saudi Arabia, out of the 27 desalination plants currently in operation, 8 are using RO. Reverse osmosis technologies account for 60% of capacity in Oman and roughly half of the capacity in Saudi Arabia. Although Kuwait was the first country in the Gulf Cooperation Council region to invest in desalination, starting in 1953 with a distillation plant, its desalination capacity is still currently mainly using MSF technology; RO only accounts for a minor share of desalinated water.

The improvement of water supply has been at the core of the Kuwait Institute for Scientific Research's (KISR) mission since its creation. It was among the themes emphasised in the 1958 concession agreement with the Arabian Oil Company (Japan) that set the ground for the creation of the institute. KISR has been a pioneer in applied research on conventional and non-conventional desalination technologies. It contributed significantly to improve MSF technologies in the 1970s and 1980s. Several brackish water RO units of 4 000 gallons per day using different types of membranes were tested by the Ministry of Electricity and Water in the early 1970s, who concluded that more research was needed. In the 1980s, co-operation was undertaken with the German Ministry of Research and Technology to identify and optimise RO membranes suitable to the Arabian Gulf seawater conditions. This partnership also included training of national manpower and transfer of RO technology to Kuwait. This joint research programme achieved significant technical advances in RO desalination technologies and demonstrated the viability of new membrane technologies. A first pilot plant was tested in the 1990s when KISR resumed its operation after the invasion by Iraq. KISR also co-operated with other Gulf countries that had started operating RO plants. However, public authorities finally agreed to implement it commercially to treat seawater only at the beginning of the 2010s (Shuwaikh plant).

Currently, desalination is still one of the core research themes of KISR's Water Research Centre (WRC). Between 2010 and 2017, two patents on water desalination were granted. Since 2004, the WRC completed 37 projects on water desalination.

One paradox is that although Kuwait was a pioneer in desalination research, it started to implement RO later than its neighbouring countries with a weaker research capacity in this area. As claimed by a WRC research staff, "*Kuwait was the first country to demonstrate the technology in the region and the last to implement it*".

Interviews and desk-based research in this area allows to list some of the reported explanations for the reluctance to adopt non-conventional – less energy-intensive – technologies:

- the reluctance of some government organisations to actively engage KISR in their long-term and strategic plans
- the absence of a clear plan for the implementation of new proven technologies, which would guide a reliable mid- to long-term research agenda at KISR
- the lack of a leader in relevant public authorities with the necessary power to promote the needed investment in and procurement of these new desalination technologies
- the tendency of public authorities to take decisions regarding future investment in desalination technologies without consulting KISR experts
- weak expertise in desalination technologies (and more generally lack of interest in and knowledge of research) of people in public authorities that are assigned to discuss with KISR
- the limited, although improving, commercialisation focus and customer orientation of KISR's staff
- bureaucratic process and audit rules resulting in lengthy procurement processes for equipment and materials
- the absence of a research budget and research department at the Ministry of Electricity and Water
- research budget restrictions (institutional funding from the Ministry of Finance and competitive funding from KFAS – the centre's major funding agency).

Sources: Information provided by KISR; KISR (2015), 8th Strategic Plan: 2015-2020; KISR (2018a), List of Completed Desalination and Distillation Projects of the Water Research Centre of KISR; Al-Zubaidi, A.A.J. (1987), "Sea water desalination in Kuwait: A report on 33 years' experience", https://doi.org/10.1016/0011-9164(87)90039-7; KISR (2018b), List of Granted Patents 1967-2017; Walton, M. (2019), "Desalinated water affects the energy equation in the Middle East", https://www.iea.org/newsroom/news/2019/january/desalinated-water-affects-the-energy-equation-in-the-middle-east.html.

Governance

KISR was reorganised by an Amiri decree issued in 1973, under which it became directly responsible, via its board of trustees, to the Council of Ministers. The main objectives of the institute, as specified in the Amiri decree, were to carry out applied scientific research, especially related to industry, energy, agriculture ad the national economy; to contribute to the economic and social development of the state; and to advise the government on scientific research policy.

A further Amiri decree, issued in 1981, formally established KISR as an independent public institution. The revised objectives of the institute remain to carry out applied scientific research that helps the advancement of national industry and to undertake studies relating to the preservation of the environment, resources of natural wealth and their discovery, sources of water and energy, methods of agricultural exploitation and

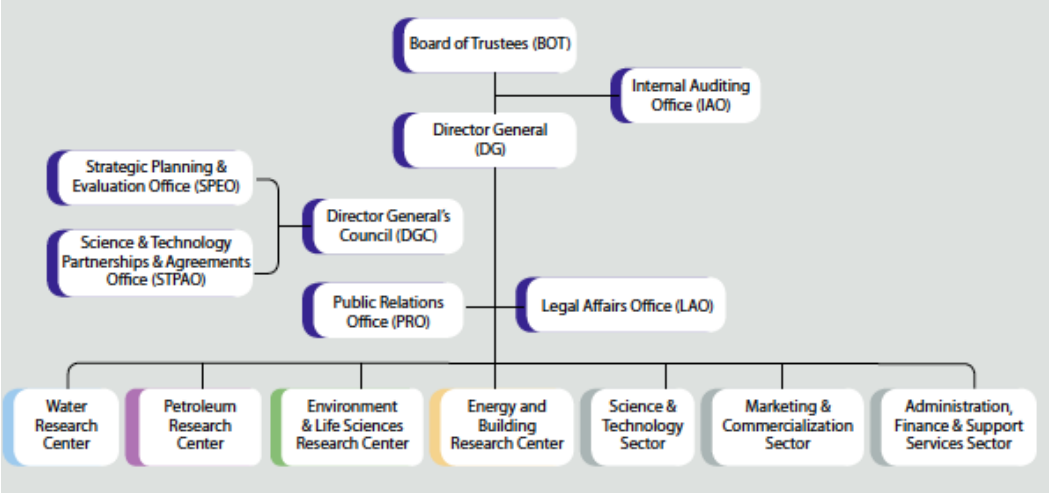
promotion of water wealth. The law entrusted the institute with undertaking research and scientific and technological consultations for both government and private institutions in Kuwait, the Gulf region and the Arab World. It confirmed KISR's role as a science advisor to the Kuwaiti government, a role which KISR intended to strengthen by providing the secretariat for the intended KSTIC advisory council (see Box 3.2).

Currently, KISR is governed by a board of trustees, chaired by the minister responsible for higher education. Other members represent major stakeholders, mainly in the government sector:

- KU;
- Ministries of Planning, Oil, Public Works, Electricity and Water, Commerce and Industry, Finance, Education, and Health;
- Kuwait Industrial Bank;
- KFAS;
- a scientific expert nominated by the board of trustees;
- KISR Director-General (rapporteur);
- a scientific advisor appointed by the board itself.

KISR's organisation (Figure 4.13) comprises four major research centres – Petroleum, Water, Energy and Buildings, and Life Sciences – and two smaller research units: the Techno-economics Division and the Software Systems Development Department, in addition to various support functions (including the Science and Technology Sector) and a commercialisation and technology transfer group.

Figure 4.13. KISR's organisational chart under the 8th Strategic Plan



Source: KISR, *8th Strategic Plan: 2015-2020*.

In 2009, the ADL undertook a large study of the strategy and process for KISR, helping underpin the "KISR transformation" project – a significant reorganisation of KISR, clarification of processes and the introduction of strategy planning tools in time for the 7th Strategic Plan, 2010-2015. One key dimension of this reorganisation was the gradual shift from a traditional R&D organisation serving the current needs of clients – ministries and oil companies for the most part – to a more forward-looking and result-oriented organisation. Achievements of this endeavour were, for instance, the creation of the Science and Technology Sector and the Marketing and Commercialisation Sector. This ambitious project faced some internal resistance, which significantly delayed its implementation. Some related initiatives were still being rolled out in 2019, such as the creation of a high-level internal scientific advisory committee.

Strategy

KISR has developed five-year strategic plans since 1976 in order to guide its development. Since 1990, the timing of its strategic plans is aligned with that of the SCPD mid-year development plans (KISR, 2017).

As previously mentioned, the "KISR transformation" project resulted in new strategy planning tools being implemented in 2010, with some positive results (Arman, 2018). Since 2013, the Science & Technology Sector is in charge of developing and monitoring the implementation of the plans. The Techno-economic Analysis Department conducts economic studies to inform the strategic orientation of the institute.

While KISR's overall goal at the time of its 4th Strategic Plan (1995-2000) was to be the "*preferred and efficient national supplier of research and access to technology in areas of national need*", its ambition is now regional, as set out in its 8th Strategic Plan: "*By 2030, KISR will be internationally acknowledged as the region's most highly respected STI and knowledge gateway, and recognised as a driving force for sustainable economic prosperity and quality of life*". Beyond the Gulf region, while the institute cannot aspire to become a leading research institution, it aims at least to become acknowledged as an "international centre of excellence" in the 10th Strategic Plan (2025-30). Internal organisation efforts have also been at the core of KISR's successive five-year plans (Table 4.11).

Table 4.11. Core issues in KISR's five-year plans to date

Strategic plan	Period	Core issues
Strategic Plan 1	1979-84	Planning of management processes, research priorities and organisational structure.
Strategic Plan 2	1984-89	Strengthening the focus of core technical research programmes through strategic recruiting and clear alignment with national development priorities.
Strategic Plan 3	1992-95	Developing a transitional strategic programme to rebuild the institute's capacity in the aftermath of the Iraqi invasion.
Strategic Plan 4	1995-2000	Aligned and prioritised national initiatives in collaboration with strategic stakeholders.
Strategic Plan 5	2000-05	Integrated advanced information technologies in support of core research initiatives and national priorities.
Strategic Plan 6	2005-10	Building up the capacity of the staff and upgraded facilities.
Strategic Plan 7	2010-15	Transforming KISR into a leading research and development institution in the region by "growing a regional footprint and building world-class niches."
Strategic Plan 8	2015-20	Continuing to fulfil goals outlined by the 7th five-year plan with focus on a regional "footprint" and "world-class niches," aimed at building an international reputation.

Source: Birzi, O.F. (2018), *Science, Technology, Innovation, and Development in the Arab Countries*, https://doi.org/10.1016/C2016-0-01541-3.

Due to its ongoing restructuration, the 7th Strategic Plan was not fully achieved and the implementation of 8th Strategic Plan was delayed (Al-Sudairawi, 2017). KISR is therefore currently in the middle of implementing its 8th Strategic Plan, 2015-2020 (KISR, 2015), which explicitly continues the work of the previous plan and states KISR's commitment to:

- advancing science and technology in Kuwait;
- promoting growth and local industries;
- advancing diversity in energy production and enhancing the efficiency of energy use;
- contributing to the country's oil industry;
- protecting the environment and biodiversity;
- ensuring that novel infrastructure projects that are being implemented produce efficient and reliable outcomes;
- contributing to meeting the country's growing water needs.

Key performance indicators have been established for monitoring the results of operational processes as part of the 8th Strategic Plan (KISR, 2015). A monitoring system with annual targets covering most of the dimensions of its activity allow to monitor the Institute's progress.

The 8th Strategic Plan sets out a vision to become the leading STI performer in the region by 2030 while aligning its long-term R&D activities to the Kuwait Mid-Range Development Plan. The plan is not specific about how that alignment will be achieved at the project level, but points out that KISR's research centres and the Techno-economic Division all work in areas of importance to the Mid-Range Development Plan. It also emphasises actions to improve customer management and develop close links with both industrial customers and other research performers in Kuwait and abroad, to improve the quality of research and innovation within the institute and improve management, planning and administration. In that regard, KISR has made efforts to involve its clients and stakeholders (Ministries, SCPD, government agencies, K-companies, etc.) as early as possible (about a year ahead) in its strategic planning process in order to identify their problems and focus on relevant solutions. Most of them, however, do not have a formal or even informal innovation strategy and their inputs to drive KISR's activities are therefore limited. A notable exception is KPC, with which KISR has a strategic R&D Agreement. A mechanism has been put in place to align KISR with KPC's priorities in the mid- to long-term and joint teams allows to co-ordinate KISR R&D activities in and technical services to K-companies. The realisation of the plans is assessed internally. The results of this assessment are presented to the board and are expected to feed into the preparation of the following plan.

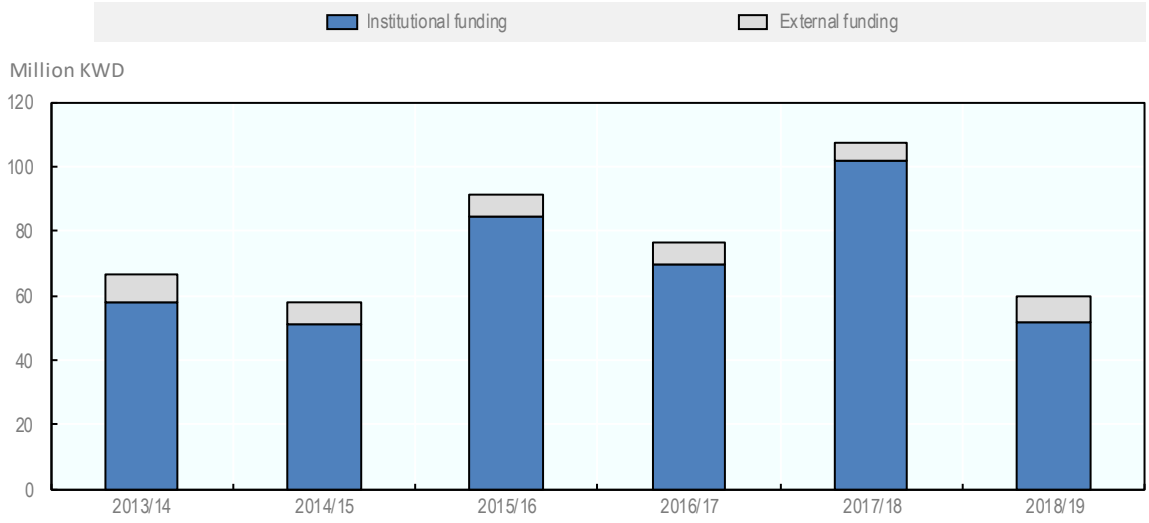
In order to improve its strategic guidance, KISR will create during the course of the 9th strategic plan an Advisory Council constituted of four to six internationally renowned leaders in the field of science and technology. In addition, a dedicated Advisory Board, composed of representatives of relevant national institutions will be created to support the orientation of each KISR Research Centre.

Funding

KISR's annual budget at the start of the 8th Strategic Plan was approximately KWD 90 million and rose to over KWD 100 million in 2017/18. It fell by more than half in 2018/19. Salaries account for 30-40% in recent years (very stable in absolute terms, around KWD 32 million) and construction 40-50% (Figure 4.14).

The budget comprises a mix of government funding and direct funding by clients. External funding fluctuated between KWD 5.5 million and KWD 8.6 million during the period 2013-19, amounting to KWD 8.2 million in 2018/19 (16% of the total budget). KFAS is the principal external funder (22.5% of revenues), followed by K-companies (20%) and foreign institutions (8%). The small private sector in Kuwait account for only 6%, despite KISR effort to develop these cooperative activities, notably since the MRDP 2010-15. The rest of revenues is contributed by various national institutions. Over 200 private and public technical and consulting services[32] were being conducted annually (87 projects completed in 2013/14, including 72 funded contractually for a budget of KWD 1.8 million; 80 services in 2018, accounting for 37 different clients). One key deterrent of fundraising at KISR is the obligation to transfer the money raised to the Ministry of Finance, which is then subtracted from the planned institutional funding awarded to the institute. In essence, this implies that any contract raised translates into more work, without additional funding.

Figure 4.14. KISR's funding, 2014-19



Source: Data provided by KISR.

Staff

In 2017/18, KISR had over 1 550 total staff, of which 910 were permanent employees. About 84% of its staff were Kuwaitis (64% among researchers only), with the balance coming from 20 different countries around the world. One-quarter of the permanent staff were researchers and 67% research assistants and associates, with the rest providing support. Just over a fifth of the 910 permanent staff held a PhD and 15% had a Master's degree. Forty-one per cent of the permanent staff were women, but this proportion falls to 27% when considering researchers only.

4.3.2. KFAS research centres

KFAS manages four external centres, including two dedicated to research, i.e. the Dasman Diabetes Institute (DDI) and the Jaber Al Ahmed Centre for Molecular Imaging and Nuclear Medicine (JAC) and one with partial research activities, i.e. the Scientific Centre of Kuwait. The last centre, the Sabah Al Ahmad Centre for Giftedness and Creativity (SAC), aims to develop youngsters' skills and promote innovation and knowledge exchange. The 2012 strategy introduced a life cycle management model into which it retrofitted KFAS' four existing centres with a view eventually to "graduating" these away from KFAS support and into other hands. Up to that point, KFAS had intermittently acceded to requests to establish and fund centres from its own resources – to such an extent that in 2012 they were responsible for 50% of KFAS' expenditure, therefore crowding out KFAS' primary mission.

The 2014 Strategic Review of KFAS pointed to several problems stemming from the position of these centres under the purview of KFAS (Technopolis, 2015). Not only were they were consuming a large and growing proportion of KFAS' total disposable funding, but the foundation seemed to have a limited control over these centres due to issues in management and governance mechanisms. For instance, their budgets seemed to be driven by past budgets rather than future strategy and their research agenda was developed bottom-up, driven by individuals' interests and opportunities. It also generated potential conflicts of interest, as KFAS acted as funder while participating in their governance. The Panel Review recommended that KFAS contribute to the reform of the centres until they can be spun-off to other funders (to the Ministry of Health in the case of the DDI and the JAC) or to establish performance contracts with them (in the case of the others), acting as an arm's-length buyer of a defined set of services at an agreed level of quality.

The Dasman Diabetes Institute

The DDI's mission is to address the diabetes epidemic in Kuwait through focused research, integrated prevention, training and education (DDI, 2018). It was set up on the instructions of the Amir in 2006 and is funded by KFAS. It aims to perform research (basic and clinical) on diabetes as well as diabetes public education activities, a disease of very high prevalence in Kuwait. It aims to become the leading diabetes institute in the Middle East and North Africa region and to be recognised internationally (DDI, 2018).

The DDI had a budget of KWD 7.88 million in 2020 (rather stable since 2017, but steady decrease in previous years: KWD 8.32 million in 2016 and KWD 9.4 million in 2014). In 2013, its budget covered by KFAS (KWD 12 million) accounted for 48% of KFAS' total budget contribution to research (estimated at about KWD 32 million) (Al-Sayed Omar, 2014). The MOH provides about KWD 3 to 4m in-kind.

The DDI had 313 employees in 2020 (including part time and contractual staff), of which 217 non-Kuwaitis and 26 staff with PhDs. There were 223 employees of 23 different nationalities in 2016 (including 57 Indians and 45 Kuwaitis) (DDI, 2016).

A 2014 peer review (Kahn et al., 2014) concluded that the institute had become a leading national player in diabetes research with some international recognition. It, however, expressed concern about the lack of focus and orientation of its research activities towards specific Kuwaiti problems. More generally, DDI research was assessed as a bottom-up collection of individual researcher-led projects, without an overall strategy from the top, which led to a broadening of the research towards other diseases (hypertension, cardiovascular disease, sleep apnoea, etc.). As a result of this dispersion, much of the research was sub-scale and addressed problems being tackled at a large scale elsewhere in the world. The report urged reform, and the separation of treatment from research, with the Ministry of Health to take over the costs of treatment. A change of leadership (a new director general, the hiring of a chief scientific officer), the development of a research strategy and significant restructuring has enabled a refocusing of the institute (KFAS, 2017b). KFAS has also supported these reforms, with a view to hand-over part of the costs of DDI to the Ministry of Health in the future. An agreement has been found, whereby the MOH provides in-kind support to DDI in the forms of medical supplies and secondments. MOH also supports financially some agreements with international partners. The negotiations with MOH are still on-going.

DDI's publications have increased substantially in recent years, from 22 in 2013 to 77 in 2019 (73 in 2016). Even more remarkable is the increase of 'original research' from 25 in 2016 to 50 in 2019.[33] It currently has about 70 ongoing projects (50 in 2014). Also noteworthy is the recent increase in the number of national collaborative projects with KU and MOH from 2017 to 2020. DDI's IP is very limited to date as its TTO office was only created in 2018.

Besides research, the DDI carries out a number of clinical services.

The Jaber Al Ahmed Centre for Molecular Imaging and Nuclear Medicine

The JAC started operating in 2013. Its mission is to provide a Positron Emission Tomography (PET) and Single Photon Emission Computed Tomography (SPECT) clinical imaging services to patients and to provide academic infrastructure for scientific research. However, it hosts only a small volume of medical research that relies on imaging. It is a facility for advanced medical imaging, providing diagnostic services for the Ministry of Health, and the production of fluorodeoxyglucose, a radioactive isotope used in PET scans for medical imaging.[34]

In 2016, the centre signed an agreement with the International Atomic Energy Agency (IAEA) to work jointly in establishing the centre as an IAEA Collaborating Centre, providing a platform for regional training activities of the IAEA in nuclear medicine (KFAS, 2017b).

The JAC is managed by doctors from the Ministry of Health. It is funded by KFAS and receives some in-kind support from MOH, with a budget of KWD 3.24 million in 2017 (KWD 3.83 million in 2016). KFAS provided KWD 1.045m in 2016 and KWD 0.970m in 2017.

KFAS has initiated discussions with the Ministry of Health regarding the preparation of a sustainability plan to provide viable alternatives to handing the centre back to the Ministry of Health, and developing a research strategy.

4.4. Research by MOH physicians in hospitals

Some MOH physicians working at local private and public hospitals perform significant research activities, as demonstrated by their number of scientific publications. For instance, the publications of physicians working at Amiri hospital have increased from 24 in 2011 to 58 in 2019. Those at the Mubarak Al-Kabeer Hospital have also published 20 to 40 articles annually between 2011 and 2019. Al-Sabah Hospital publishes around 15 to 30 articles per year during the same period. Most of the publications of these hospitals have been produced in collaboration with researchers from KU or the Health Sciences Centre.

These performance are rather remarkable since there is very little institutionalisation of research activities, both in hospitals and at MOH. There is no obligation nor dedicated time (or time flexibility) for doctors to perform any research activities in their home institution (but research activities are considered for career promotions). Nor any dedicated programme, department of scheme to support research at the MOH. Hence, doctors in hospitals who decide to engage in research activities do it on their own initiative. They inform and seek approval from the MOH but have to secure funding elsewhere.

KFAS is an important funder of research initiated by MOH physicians in hospitals through its calls for research proposals. In 2017, KFAS contribution to research in hospitals was about KWD 109K (not including salaries and in-kind contributions from MOH, providing for instance medical equipment and materials). Between 1978 and 2017, KFAS awarded KWD 1.2m to 44 research projects in hospitals, which represents 4% of the total number of projects awarded by KFAS during this period (KFAS, 2017c).

Research in health has become a growing priority at KFAS which has led to more funding being invested in this area. Some projects are also financed partially through KU internal funding scheme when conducted in collaboration with KU academics. Finally, a few doctors performed research in cooperation with pharmaceuticals. No data is available on private sources of funding.

4.5. KFAS' competitive and strategic research funding

Apart from the institutional funding received by each institution, KFAS is the main source of external funding of basic and applied research. This section focuses on research funding and does not intend to reflect the entirety of KFAS' activities to support research via other complementary means (for instance, via a number of prizes awarded to renowned researchers, the organisation of or support to scientific and networking events to raise the awareness of policy makers and citizens on the importance of science, training and support to the mobility of students and researchers, etc.).

4.5.1. KFAS' Research Directorate structure and research grant portfolio

Since 1977, KFAS' Research Directorate (RD) supports the advancement of science and research in Kuwait in different ways, mainly through the allocation of research grants, but also through its support to researcher and research institutions' capacity building and networking. Currently with a staff of about 20, the RD is responsible for the implementation of the Strategic Thrust 2 of KFAS' Strategic Plan 2017-2021 "Enhancing R&D capacity in Kuwaiti scientific institutions", which aims to (KFAS, 2017b):

- enhance the national research profile and capacity;
- build capacity within the research community through initiatives in collaboration with international entities;
- steer research activities towards national priority issues;
- accelerate the deployment of technologies benefiting society.

In order to realise these objectives, the RD operates three programmes: the Research Grant Program, the Capacity Building Program and the Flagship (or "Mega") Projects Program. For the most part, these programmes operate via the competitive allocation of grants to researchers through their organisation following a peer review process, following different rules according to the type and size of grant. Some funds are allocated in a more top-down fashion to initiate projects of direct relevance to national priorities. The different types of grants are (KFAS, 2016a):

- National Priority Research Grants: These grants are designed to address research areas of national priority, in line with the National Development Plan of Kuwait.
- Early Career Research Grants are intended to support early career researchers (within 7 years from completing their Ph.D. degree) towards establishing their research careers and enhancing their professional development, in priority areas. Funding limit is KWD 10 000.
- Exploratory/Developmental Grants aim to support research proposals in early and conceptual stages of development, which, if successful, may lead to a breakthrough in the development of novel techniques, agents, methodologies, models, or applications, in priority areas. Funding limit is KWD 10 000.
- General Grants are intended to support proposals that span all research fields, beyond national priority areas, from basic sciences to industrially applicable sciences, technical innovations, and research related to the need of the Kuwaiti private sector, and research that have clearly demonstrated application of high value to the society and economy of Kuwait.

In 2015, KFAS was subject to a panel review of its progress in implementing its 2012-16 Strategic Plan. The conclusions of this exercise led to a significant restructuring and reorientation of KFAS. The main conclusions for the Strategic Thrust 2 are synthesised in Box 4.7.

Box 4.7. Main conclusions of the 2015 KFAS panel review: Strategic Thrust 2 (research)

Strategic Thrust 2 (ST2) plays an important role in the Kuwaiti research and innovation funding system by providing external, competitive, project-based research funding as a complement to that which research-performing organisations provide through their own institutional funding.

ST2 P1 Research Grant Programme

- This programme acts as Kuwait's quasi-national research funding council, funding investigator-led proposals "bottom-up". It has demonstrated significant improvement over the period 2012-16. This important function must continue, although administrative efficiency could be further improved.
- The monitoring of the scientific quality of Kuwaiti research outputs (bibliometric study) would clarify the need for development and could be used not only to help KFAS focus its efforts, but also to encourage the management of research-performing organisations to develop their organisations' capabilities further.

ST2 P2 Environmental and P3 Water and Energy Research Programmes

- These programmes channel research efforts towards areas of national importance where significant innovations are needed. They continue functions that KFAS has performed since its early days. The direction of the ST2's work is correct and consistent with KFAS' mission, but it needs to be done more efficiently.
- KFAS could consider using visits by foreign peer reviewers as a way to support capacity building in research organisations as well as funding capacity-building behaviour in the research organisations.
- Governance should be broadened to prevent capture by the beneficiaries and expose the research to demands and opportunities from the wider world.
- The ST2 could benefit from an international scientific advisory committee – both as a way to get scientific advice on its operations and as a tool for encouraging the development of the research system more widely.

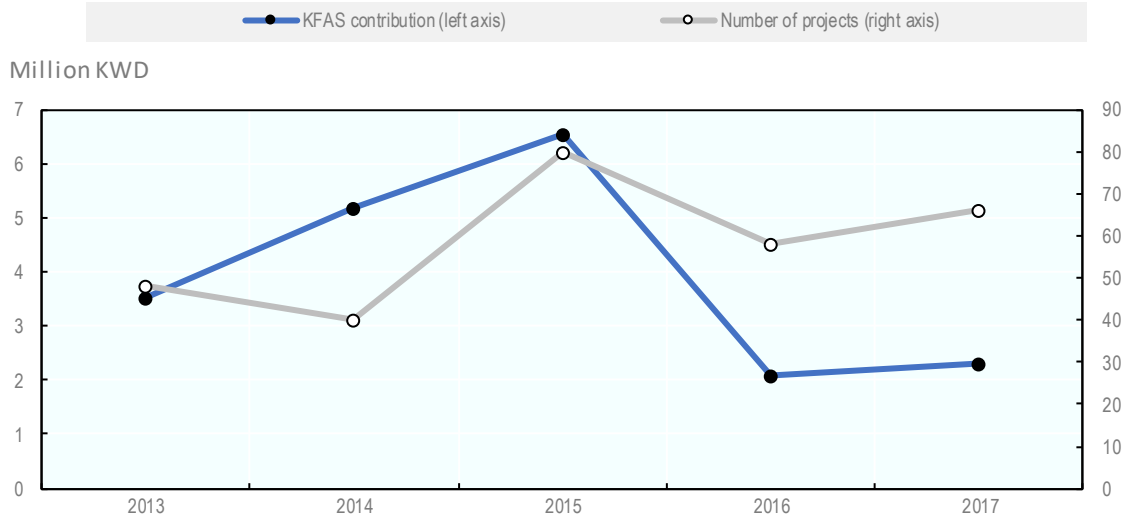
Source: Technopolis (2015), KFAS Strategic Review, Final Report.

In addition to the three programmes mentioned above, a newly created Collaborative Research Unit manages specifically the research-related aspects of regional and international collaborations with a number of leading foreign institutions such as SciencePo, Harvard Business School, London School of Economics, etc.[35]. These activities partly use the different types of grants previously listed. One of the most important and longer-term collaborations is the one with the Massachusetts Institute of Technology (MIT) that used to be managed by the MIT and paid for entirely by KFAS. In order to enhance the impact of this partnership in Kuwait (through technology transfer, capacity building of researchers of KU and KISR, etc.), it is now directly managed by KFAS. The Collaborative Research Unit allocated KWD 1.43 million to the Kuwait-MIT programme in 2017. It currently includes collaborative projects on desalination and sewage treatment.

4.5.2. Funds allocated to research

In 2017, KFAS awarded KWD 2.33 million in grants (KWD 2.07 million in 2016), a significant decrease compared to 2015 (Figure 4.15). The average size of grants has also decreased, from KWD 130 000 in 2014 to KWD 35 000 in 2017.

Figure 4.15. Number of projects and amount of funds allocated by KFAS Research Sector, 2013-17



Sources: KFAS (2017d), *Research Directorate Annual Report 2017*, https://www.kfas.org/media/addba2c1-5dfe-4b03-8697-5fe2b9bc5389/t-93VA/Publications/Files/RD%20Annual%20Report%202017%20en%20-%20web.pdf; KFAS (2016b), *Research Directorate Annual Report 2016,* Kuwait Foundation for the Advancement of Sciences; KFAS (2014l), *Research Directorate Annual Report 2014*, https://www.kfas.org/media/231f32d0-8ddb-478f-a873-1054cd0271cd/4PsZ1A/Publications/Files/KFAS%20Research%20Annual%20Report%202014%20-%20EN.pdf.

Funds are allocated mainly through the general competitive grants. The Flagship Project Programme, which deals with national priority research grants, accounted for about 8% of allocated funds in 2017. These projects come in smaller numbers and are concentrated in the areas of water, environment and energy.[36] Among these projects are, for instance, the development of a Kuwait energy strategy or support for the installation of home photovoltaic systems (both by KISR). KFAS has long been a supporter of research and demonstration of sustainable technologies. It has helped fund several pilot projects in the area of solar energy systems, such as the Shagaya Renewable Energy Park, but considers it has neither the necessary resources nor the mandate to scale-up these activities. The handover to the Ministry of Electricity and Water has proved difficult and the development and diffusion of these technologies has experienced delays as a consequence.

During the period 2015-17, KFAS selected 215 projects and awarded about KWD 11 million (hence about KWD 3.7 million per year, but with significant variations, as shown in Figure 4.16) to various Kuwaiti research institutions, as well as to some international partners (mainly US universities). On average, projects received KWD 53.4 000. In most cases, the host institution of the beneficiaries contribute to the project since KFAS does not cover all the costs (salaries for instance). The main recent beneficiaries are KISR and KU, as well as one private university (Table 4.12). Apart from the recent emergence of private universities among its beneficiaries, as evidenced by the good performance of the Gulf University for Science and Technology in 2017, KFAS does not finance research in private companies under its research grant programmes.

Table 4.12. Main beneficiaries of KFAS' research grants, 2015-17

		KFAS grant		Co-funding		Co-funding rate
	Number of projects	Total amount (KWD)	Average	Total amount (KWD)	Average	
Kuwait Institute for Scientific Research (KISR)	61	2 650 478	43 450	6 697 088	115 467	72%
Kuwait University (KU)	54	3 677 579	68 103	2 921 108	59 614	44%
Gulf University for Science and Technology	31	404 006	13 032	258 484	13 604	39%
Ministry of Health	12	332 107	27 676	585 698	73 212	64%
Public Authority for Applied Education and Training (PAAET)	9	176 704	19 634	508 766	56 530	74%

Source: Data provided by KFAS.

In a longer term perspective, KISR (with about KWD 20 million, or 40% of the total funds awarded) and KU (KWD 14 million, or 28%) have accounted for the bulk of the KWD 45 million of funding awarded by KFAS to research institutions since it started operating in 1978 (KFAS, 2017c). The amounts received by these institutions per year remain rather limited, both in total and in average, although they are generally bigger in size than the projects financed internally by these institutions. Given the paucity of available external funding, KFAS is still their main external funder. During interviews, officials at both KISR and KU expressed strong concerns about KFAS' decreasing research grant budget, in total volume and per project.

4.5.3. Grant allocation process

The process for awarding grants is well-structured and calls upon international reviewers for selecting the proposals (430 reviewers were mobilised in 2017). Larger projects go through a multi-stage reviewing mechanism comprising a review by international peers and the Research Funding Council. The council, comprising KFAS' Deputy Director General for Strategic Thrust Programs and RD director, as well as external experts from national institutions, adds a top-down element to the selection of large projects by ensuring their relevance to national priorities.

All grants included, KFAS received 140 proposals and rejected 24 in 2017 – hence an acceptance rate of 83%. This rate is in line with results obtained in previous years, despite the lower number of proposals (223 proposals received and 188 selected in 2012; 254 proposals received and 213 selected in 2013). Although this rate widely varies among countries and scientific disciplines, it is lower in most research agencies of OECD countries with a strong research base. A recent survey undertaken by the OECD Global Science Forum found that a majority of research support schemes have success rates of 10-40% (OECD, 2018a). During interviews, KFAS officials stressed that the quantity and quality of research proposals is often weak, but regularly improving. KFAS' management costs are consistent with international practices, around 5-6% in recent years (in the 20-30% range prior to 2010).[37]

References

ACK (2018a), ACK Annual Report for the Academic Year (2016/2017), Australian College of Kuwait.

ACK (2018b), *Faculty Research Output 2016/2017*, Australian College of Kuwait.

AIT et al. (2017), *Background report OECD Review of Innovation Policies: Austria*.

Al-Mutairi, A., K. Naser and M. Al-Enezi (2017), "Job Satisfaction among Academicians at Business Colleges Operating in Kuwait", *Asian Social Science*, Vol. 13/12, p. 9, http://dx.doi.org/10.5539/ass.v13n12p9.

Al-Saadi, Y. (2015), "Overview of Kuwait's educational landscape"*, HEAR Working Papers*, Higher Education in the Arab Region, http://arabhighered.org/wp-content/uploads/2015/11/Al-Saadi-Kuwait.pdf.

Al-Sayed Omar, E. (2014), *Scientific Research Initiatives in Kuwait*, Kuwait Foundation for the Advancement of Sciences.

Al-Sudairawi, M. (2017), *Science & Technology Sector (STS) Role in KISR Transformation*, Powerpoint presentation, Kuwait Institute for Scientific Research.

Al-Zubaidi, A. (1987), "Sea water desalination in Kuwait: A report on 33 years' experience", *Desalination*, Vol. 63, pp. 1-55, https://doi.org/10.1016/0011-9164(87)90039-7.

ANR (2017), *Soutenir la recherche sur projets dans sa diversité: Rapport d'activité 2017*, Agence Nationale de la Recherche, https://anr.fr/fileadmin/documents/2018/ANR-rapport-activite-2017.pdf.

Arman, H. (2018), "The influence of the strategic planning approach on the research agenda of RD organizations", in F. Calisir and H. Camgoz Akdag (ed.), *Industrial Engineering in the Industry 4.0 Era*, Springer.

Arnold, E. et al. (1999), *Evaluation and SWOT Analysis of KISR's Fourth Strategic Programme (1995-2000)*, Technopolis.

Barham, B., J. Foltz and D. Prager (2014), "Making time for science", *Research Policy*, Vol. 43/1, pp. 21-31, http://dx.doi.org/10.1016/J.RESPOL.2013.08.007.

Bizri, O. (2018), *Science, Technology, Innovation and Development in the Arab Countries*, Elsevier, https://doi.org/10.1016/C2016-0-01541-3.

Borowiecki, M. and C. Paunov (2018), "How is research policy across the OECD organised?"*, OECD Science, Technology and Industry Policy Papers*, No. 55, OECD Publishing, Paris, https://doi.org/10.1787/235c9806-en.

DDI (2018), *Strategic Business Plan 2018-2022 Overview*, Dasman Diabetes Institute, Kuwait City.

DDI (2016), *Annual Report 2016*, Dasman Diabetes Institute, Kuwait City, https://www.dasmaninstitute.org/wp-content/uploads/2019/12/Annual-Report-2016.pdf.

Franzoni, C., G. Scellato and P. Stephan (2011), "Changing the incentives to publish", *Science Policy*, Vol. 333/6 043, pp. 702-703, http://dx.doi.org/10.1126/science.1197286.

Ghareeb, N. (2010), *Academic Freedom of Faculty Members at Kuwait University: Issues of Understanding and Freedom of Research and Publishing*, PhD Thesis, Cardiff University, http://orca.cf.ac.uk/54406.

Hanover Research (2013), *Strategic Planning in Higher Education: Best Practices and Benchmarking*, Hanover Research, https://www.hanoverresearch.com/insights-blog/strategic-planning-in-higher-education-best-practices-and-benchmarking/.

Huisman, J. (2017), "Institutional diversity in higher education, institutional profiling", in J.C. Shin & P. Teixeira (ed.), *Encyclopedia of International Higher Education Systems and Institutions*, Springer, http://dx.doi.org/10.1007/978-94-017-9553-1_32-1.

Huisman, J. et al. (2015), “Measuring institutional diversity across higher education systems”, *Research Evaluation*, Vol. 24/4, pp. 369-379, http://dx.doi.org/10.1093/reseval/rvv021.

Kahn, R. et al. (2014), *Peer Review of the Dasman Diabetes Institute*, Technopolis, Brighton.

KFAS (2017a), *Background report for the country of Kuwait - OECD country review 2017*, KFAS.

KFAS (2017b), *KFAS High-level Strategic Plan 2017-2021*, Kuwait Foundation for the Advancement of Sciences.

KFAS (2017c), *Research Directorate Annual Report 2017*, Kuwait Foundation for the Advancement of Sciences, https://www.kfas.org/media/addba2c1-5dfe-4b03-8697-5fe2b9bc5389/t-93VA/Publications/Files/RD%20Annual%20Report%202017%20en%20-%20web.pdf.

KFAS (2017d), *Annual report - 2017*, KFAS, https://www.kfas.com/media/publications.

KFAS (2016a), *KFAS Research Grant Manual*, Kuwait Foundation for the Advancement of Sciences, http://www.kfas.com/media/09599ceb-5bd6-470b-ae32-00490bb91e4a/hkJDAA/Documents/KFAS%20Research%20Grant%20Manual%20Call%202016.pdf.

KFAS (2016b), *Research Directorate Annual Report 2016*, Kuwait Foundation for the Advancement of Sciences.

KFAS (2014), *Research Directorate Annual Report 2014*, https://www.kfas.org/media/231f32d0-8ddb-478f-a873-1054cd0271cd/4PsZ1A/Publications/Files/KFAS%20Research%20Annual%20Report%202014%20-%20EN.pdf.

KISR (2018a), *List of Completed Desalination and Distillation Projects of the Water Research Centre of KISR*, Kuwait Institute for Scientific Research.

KISR (2018b), *List of Granted Patents 1967-2017*, Kuwait Institute for Scientific Research.

KISR (2017), *Five Decades of Research, Development and Innovation*, Kuwait Institute for Scientific Research.

KISR (2015), *8th Strategic Plan: 2015-2020*, Kuwait Institute for Scientific Research.

Koier, E. et al. (2016), *Spinning Plates: Funding Streams and Prioritisation in Dutch University Research*, Rathenau Instituut, The Hague, https://www.rathenau.nl/en/knowledge-ecosystem/spinning-plates.

KRRP (2007), *Report of the Kuwait Research Review Panel*, Kuwait Research Review Panel.

KU (2018), *KU at a Glance 2018*, Kuwait University.

KU (2017), *KU Research Sector Accomplishments - 2015/6*, Kuwait University.

KU (2015), *Strategic Plan 2013-2017*, Office of the Vice President for Planning, Kuwait University, http://www.planning.kuniv.edu.kw/download/%D8%A7%D9%84%D8%AE%D8%B7%D8%A9%20%D8%A7%D9%84%D8%A5%D8%B3%D8%AA%D8%B1%D8%A7%D8%AA%D9%8A%D8%AC%D9%8A%D8%A9/En/Stratigical%20Plan.pdf.

Kwiek, M. (2016), “The European research elite: A cross-national study of highly productive academics in 11 countries”, *Higher Education*, Vol. 71, pp. 379-397, http://dx.doi.org/10.1007/s10734-015-9910-x.

OECD (2019), *OECD Reviews of Higher Education, Research and Innovation Policy: Portugal*, OECD Publishing, Paris, https://doi.org/10.1787/9789264308138-en.

OECD (2018a), “Effective operation of competitive research funding systems”, *OECD Science, Technology and Industry Policy Papers*, No. 57, OECD Publishing, Paris, https://doi.org/10.1787/2ae8c0dc-en.

OECD (2018b), “The governance of public research policy across OECD countries”, in *OECD Science, Technology and Innovation Outlook 2018: Adapting to Technological and Societal Disruption*, OECD Publishing, Paris, https://doi.org/10.1787/sti_in_outlook-2018-14-en.

OECD (2018c), *OECD Reviews of Innovation Policy: Austria 2018*, OECD Reviews of Innovation Policy, OECD Publishing, Paris, https://doi.org/10.1787/9789264309470-en.

OECD (2017), *OECD Reviews of Innovation Policy: Norway 2017*, OECD Reviews of Innovation Policy, OECD Publishing, Paris, https://doi.org/10.1787/9789264277960-en.

OECD (2016), *OECD Reviews of Innovation Policy: Luxembourg 2016*, OECD Reviews of Innovation Policy, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264232297-en.

OECD (2015), *The Innovation Imperative: Contributing to Productivity, Growth and Well-Being*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264239814-en.

OECD (2013), *Education at a Glance 2013: OECD Indicators*, OECD Publishing, Paris, https://doi.org/10.1787/eag-2013-en.

OECD (2010), *The OECD Innovation Strategy: Getting a Head Start on Tomorrow*, OECD Publishing, Paris, https://doi.org/10.1787/9789264083479-en.

PAEET (2019a), *Research Report 2018*, Public Authority for Applied Education and Training, http://paaetwp.paaet.edu.kw/ResearchAdmin/wp-content/uploads/2019/08/RR2018.pdf.

PAEET (2019b), *Explanatory Note to the Final Account for the Fiscal Year 2018-2019*, Public Authority for Applied Education and Training.

Pruvot, E., A. Claeys-Kulik and T. Estermann (2015), *Designing Strategies for Efficient Funding of Universities in Europe*, European University Association, Brussels, https://eua.eu/downloads/publications/designing%20strategies%20for%20efficient%20funding%20of%20universities%20in%20europe%20define.pdf.

Technopolis (2015), *KFAS Strategic Review, Final report*, Technopolis, Brighton.

THE World University Rankings (2019), *Top Universities With the Best Student-to-staff Ratio 2019*, Times Higher Education, https://www.timeshighereducation.com/student/best-universities/top-universities-best-student-staff-ratio (accessed on 29 October 2019).

Walton, M. (2019), *Desalinated water affects the energy equation in the Middle East*, IEA News, https://www.iea.org/newsroom/news/2019/january/desalinated-water-affects-the-energy-equation-in-the-middle-east.html.

World Bank (2016), *International Trends and Good Practices in Higher Education Internal Funding and Governance*, World Bank, https://www.che.de/wp-content/uploads/upload/LV_2nd_HEd_RAS_Ph1_Trends_and_Practices_20Dec16_post_review_final_2055.pdf.

Notes

[1] In Finland, for instance, the Academy of Finland provides funding to support and speed up the strategic profiling of Finnish universities in order to improve their capacity for enhancing the quality and relevance of their research activities. See: https://www.aka.fi/en/research-and-science-policy/university-profiling.

[2] Notably, they are based on a limited set of indicators, many of which derive from surveys.

[3] SDG 10 – Reduced inequalities; SDG 11 – Sustainable cities and communities; SDG 16 – Peace, justice and strong institutions; SDG 17 – Partnerships for the Goals.

[4] Several of these hindering factors are discussed in more depth later in this chapter.

[5] Monitoring data provided by Kuwait University.

[6] In absolute numbers, out of 1 591 faculty in 2017/18, 349 had issued at least one publication. It should be noted that the review team, using Scopus, has found a larger number of KU publications for recent years.

[7] Q1 journals are those in the first quartile of journals ranked by level of impact factor according to the JCR ranking.

[8] Information provided by KU's Office of the Vice President for Research (June 2019). See also the website of KU's College of Engineering and Petroleum, which details the planning process: www.eng.kuniv.edu/?com=content&act=view&id=342.

[9] Budget data were provided by KU. Data on the number of students until 2015/16 are available on the statistics page of the KU website: www.planning.kuniv.edu.kw/Statistics_En_1.aspx.

[10] In 2016/17, the Research Sector was allocated only KWD 652 000. The KU Finance Department covered additional expenditures.

[11] KU's first budgetary allocation for research was in 1979/80 (KWD 0.5 million).

[12] In 2005-06, research at KU accounted for 1.6% of the university's total budget (not including tenured faculty wages) (KRRP, 2007).

[13] Information provided by KU.

[14] Based on an assumption of an average wage of KWD 35 000 per year for faculty members, a 30% overhead rate and 22% of the staff spending 30% of their time in research on average.

[15] The survey is based on 141 responses from academic staff in business colleges, including 42 from public universities (21 in both KU and PAEET). This low number of responses does not allow conclusions to be drawn at the level of each institution.

[16] Also known as “new universities”, post-1992 universities are mainly former polytechnics in the United Kingdom that were given university status through the Further and Higher Education Act 1992, or institutions that have been granted university status since 1992.

[17] Scientific leaves allow Kuwaiti faculty to perform research activities through affiliation to universities and scientific institutions abroad. Going on a scientific mission can take place after two years of teaching at the university.

[18] There were 5 PhD students in natural science, 19 in medical and health sciences, and 48 in humanities in 2017/18.

[19] As previously mentioned, these bibliometric data are likely to be underestimated for previous years.

[20] See Barham, Foltz and Prager (2014) and Kweik (2016).

[21] For instance, a KWD 600 000 grant over 36 months was awarded to a project on photovoltaics. The largest “research units and laboratories” project was awarded KWD 940 000 (KU, 2017).

[22] Q1 journals are those in the first quartile of journals ranked by level of impact factor according to the JCR ranking.

[23] Almost equally male and female. About one-quarter in law, and about a tenth in science, engineering and Islamic studies.

[24] HESA statistics: https://www.hesa.ac.uk/news/17-01-2019/sb252-higher-education-student-statistics.

[25] Assuming a five-year completion and no dropouts from the PhD programmes, there would be (445+72)/5=103 graduates per year.

[26] Information provided by PAEET (document in Arabic, OECD translation).

[27] Colleges: Basic Education, Business Studies, Health Science, Technological Studies. Institutes: Higher Institute of Energy, Higher Institute of Telecommunication and Navigation, Industrial Training Institute, Nursing Institute, Constructional Training Institute, Vocational Training Institute.

[28] Information provided by PAEET.

[29] This is for instance the case of the American University of the Middle East.

[30] OECD own analysis of KISR publications based on the Scopus database shows significantly lower numbers of publications for earlier year and rather consistent numbers for recent years. This might be related with the extension of the scope of publications indexed in the Scopus database, now covering also the academic literature where KISR authors publish. Also, KISR internal rules have recently changed. Prior to 2018, some publication projects that were not published in the end could be included in the Institute’s own statistics. Conversely, after the 2018 reform of publishing rules, some publications might not be reported to KISR.

[31] The field energy includes all energy areas, i.e. fossil fuels and renewables.

[32] Technical and consulting services are defined as activities of limited scope and duration customised to specific clients’ needs (KISR, 2017).

[33] Original research is defined as papers based on research performed in-house and at least partly funded by DDI. The 2014 peer review had asked DDI to focus on such research.

[34] Fluorodeoxyglucose has a half-life of 109.8 minutes and therefore needs to be produced close to where it is used.

[35] Another department – International Relations and Strategic Partnerships manages the international partnerships in general.

[36] The RD was restructured in 2016. Prior to this, it comprised three programmes: the Research Grant Programme, the Environmental Research Program (KWD 653 000 in 2016), and the Water and Energy Program (KWD 200 000) (KFAS, 2016b).

[37] It is, for instance, about 5.5% at the French National Research Agency (ANR, 2017).

5 Innovation in the business sector in Kuwait

This chapter presents the business innovation activity in Kuwait. It starts with some background concerning the diversification issue and the imperative for Kuwait to develop into a knowledge-based economy and society. It then gives a brief overview of the characteristics of an efficient business innovation system, based on international experience, discussing the role of research and development in enterprises, innovative entrepreneurship, knowledge diffusion, and business-academia linkages. The chapter then analyses the structure of the Kuwaiti business sector, which is dominated by state-owned enterprises in oil and other strategic sectors, with a relatively underdeveloped small and medium-sized enterprise sector. The chapter moves on to discuss the innovation and R&D performance in enterprises, followed by an analysis of business-academia co-operation and linkages. The final section discusses Kuwaiti policies in favour of innovation and R&D in the business sector, which has many opportunities for improvement.

5.1. Background

Kuwait is facing a diversification imperative. As discussed in Chapter 2, the oil rent has enabled Kuwait to develop its economy throughout much of the past century, and attain high levels of prosperity and human development. Kuwait's oil reserves are still abundant, and will last for another century at current production levels.

Peak oil supply is no longer widely supported, as unconventional oil sources complement classical ones (Bardi, 2019). Nevertheless, peak-oil demand seems more likely, in particular in the wake of increasing global concerns about carbon emissions, complemented by the development of renewable energy sources and alternative mobility solutions. Peak oil demand could set on anywhere between 2025 and 2040 according to different scenarios. It might also go through cycles according to price evolutions – for example US oil consumption has already peaked in 2005 and declined until 2014, but since the oil price decrease in 2014/5, it is on the rise again and may yet surpass the 2005 peak (Dale and Fattouh, 2018). Predictions about the future of oil demand are uncertain, but the shift from peak oil supply to peak oil demand is a substantial paradigm shift from a world of scarcity, which is essentially a seller's market, to a world of abundance, which is a buyer's market.

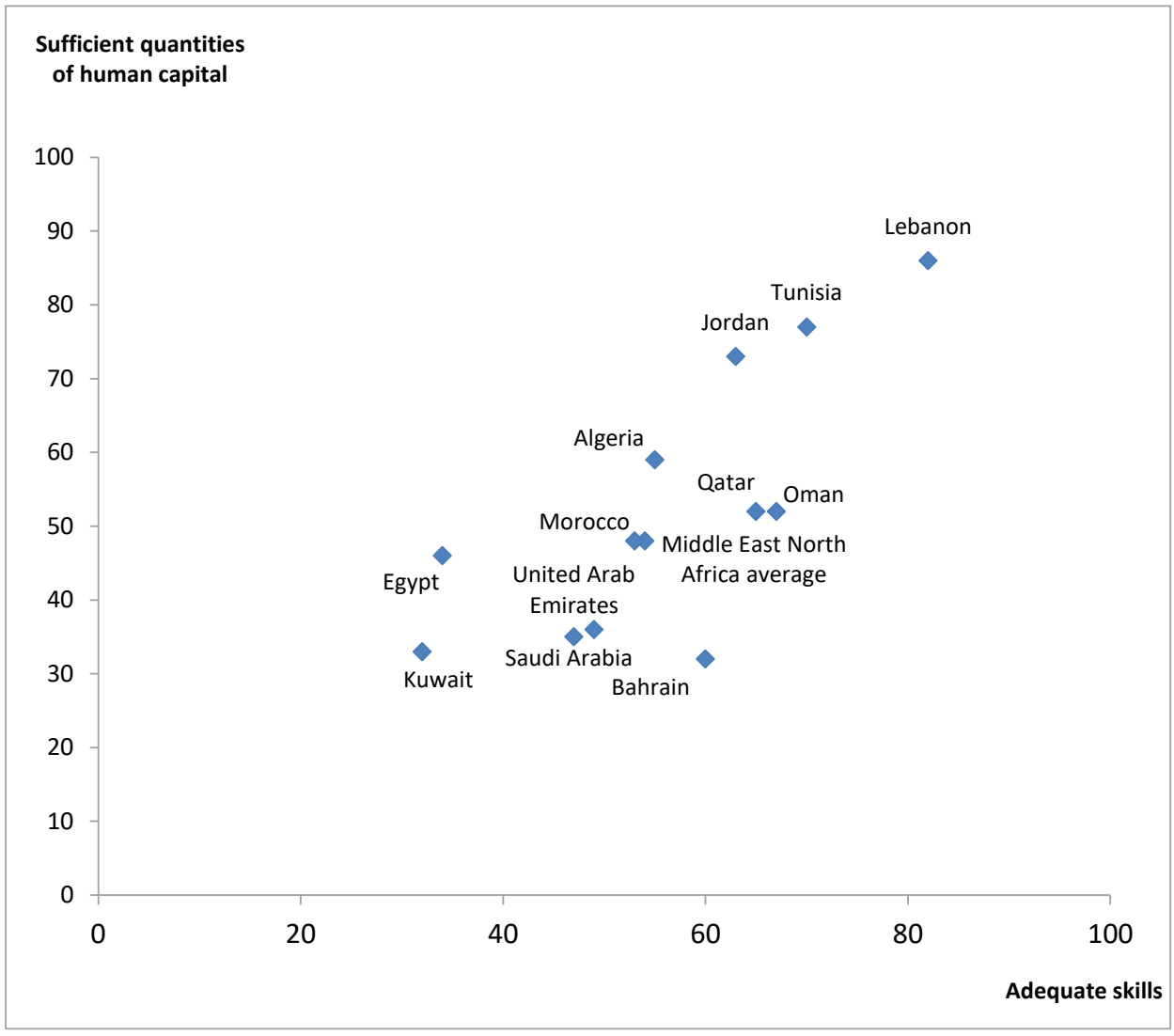
These prospects will thus urge Kuwait's leadership to accelerate the transition from a rentier economy towards a knowledge-based one, where value creation, the resolution of societal challenges and the well-being of society at large will be based on the production, diffusion and implementation of knowledge.

The skills dimension is particularly critical to achieve the transition to a knowledge-based society. The skills gap in Kuwait is particularly acute, and this represents a strong hurdle which Kuwait needs to overcome. In a 2008 survey, only 32% of the surveyed chief executive officers (CEOs) said that the education system provides people with adequate skills, and 33% said those skills were provided in sufficient quantity (Mohammed Bin Rashid Al Maktoum Foundation and Price Waterhouse Coopers, 2008). This is the lowest percentage within the entire Middle East and North Africa (MENA) region (Figure 5.1). Skills required by the CEOs were most importantly, communication skills, teamwork, analytical and critical skills, initiative, language skills, and innovative and creative thinking, while memorisation skills were considered as less important. On the other hand, curricula were considered to be based on theory rather than practical knowledge (for 71% of respondents in Kuwait).

As will be argued in Section 4.2, policy intervention in the domain of business innovation is justified by market failures. Such market failures are exacerbated in Kuwait due to the small size of firms as well as small markets which are insufficiently integrated into global value chains. These features make it less attractive for foreign capital to invest in innovative projects in the country. Skills gaps, combined with brain drain, also limit the creative forces which could drive innovation. In such an environment, it is crucial to achieve the right policy mix to raise awareness and create incentives for businesses to invest more in research, development and innovation.

Going forward, the growing imperative to tackle societal challenges calls for new types of policy intervention that are able to cope with failures that go far beyond those that characterise markets and structural systems (e.g. lack of investment in infrastructures or weak "static" capabilities in firms and administrations). Addressing societal challenges raises the issue of how to cope with various types of societal transformational system failures and what role governments should have in doing so (Weber and Rohracher, 2012). Although Kuwait has not set targets to reduce emissions as part of the Paris Agreement it signed in 2016, it has set an objective to diversify its energy production. By 2030, 15% of its total energy production should be generated from renewable sources, which will call for important technological and societal changes.

Figure 5.1. Skills gap in the Middle East and North Africa region



Note: This is a result of a survey of 587 Arab chief executive officers across 18 Arab countries and 12 industry sectors. Thirty-four Kuwaiti CEOs participated in the survey. MENA denotes the regional average of Middle East and North Africa.
Source: Mohammed Bin Rashid Al Maktoum Foundation and Price Waterhouse Coopers (2008), *Arab Human Capital Challenge: The Voice of CEOs*, https://www.pwc.com/m1/en/publications/abir/ahccenglishfeb172009.pdf.

5.2. Main characteristics of an efficient business innovation system

5.2.1. Research, development and innovation in businesses

The knowledge created through R&D performed by businesses, the public sector and foreign firms is a determinant of long-term productivity growth (Guellec and Van Pottelsberghe de la Potterie, 2004). Market mechanisms alone cannot ensure optimal levels of business investment in innovation. This is because innovation suffers from three market failures: 1) uncertainty (both technological and commercial), which is much higher than the risk taken in usual business situations; 2) indivisible upfront fixed costs (such as the cost of developing a prescription drug); and 3) the public good nature of innovation outputs, which makes it difficult for a firm to accrue the full benefit for itself.

Government spending on R&D is justified to overcome these market failures. It can also be justified through the high social rate of return. Social return to R&D is believed to exceed private returns by 50-100% or more (Mohnen, 2018). Innovation can also come from sources other than R&D; notably, non-technological innovation.

Science, technology and innovation (STI) policy spans the entire innovation value chain: from the creation of fundamental knowledge in basic research through applied research and technology, all the way to the provision of innovative products and services in the marketplace. While there is no natural and linear flow of knowledge and technology between these different stages, and innovation can occur with or without technological content, government policy action needs to support both public and private STI activities, and facilitate flows of knowledge between the different sectors.

Indeed, support for fundamental and applied research alone may lead to excellent scientific results, but there is no guarantee that the business actors will follow up on these results and take them to market due to the market failures mentioned above. The situation in Kuwait testifies to this, since the bulk of the support has gone to fundamental and applied research in the Kuwait Institute for Scientific Research (KISR) and Kuwait University, while R&D in business hasn't been supported by government.

5.2.2. High growth and innovative entrepreneurship

While there is a consensus about the need and justification for government intervention in favour of research, development and innovation in enterprises in order to overcome the market failures mentioned above, there is a debate over the approach to entrepreneurship vs. targeted small and medium-sized enterprise (SME) policy, as well as more general industrial policy.

Entrepreneurship policy is targeted at fostering new entrepreneurs to start their own businesses, whereas targeted SME policy helps existing SMEs grow and prosper. Support can be given in the form of financial support (grants, loans), or soft support such as training and business advisory services. Both types of policies can be justified, and also criticised.

For example, entrepreneurship policies can boost new firm creation, but such creation is not proven to increase wealth creation overall, notably due to the high failure rates. For example, an analysis of Global Entrepreneurship Monitor data on 37 countries shows that only high growth potential entrepreneurship is found to have a significant impact on economic growth (Wong, Ho and Autio, 2005). A meta-analysis also shows that entrepreneurial activity has a positive effect on growth in highly developed countries, but a negative effect in developing ones. It also concludes that developing countries need to attract multinational enterprises in order to stimulate the positive externalities on small firms (Sternberg and Wennekers, 2005). Indeed, policies incentivising entrepreneurship of any type will lead optimistic, but poorly resourced and skilled, people to start a venture and end up in a position more difficult than if they had continued to work as employees.

Selective SME policy can, on the other hand, focus government resources on a segment of companies with a likelihood of growth and job creation. Research shows that fast-growing firms have a direct and disproportionate impact on employment and competitiveness, with some 50% of the new jobs created coming from only 4% of the firms (OECD/IDRC, 2013). The effectiveness of such support programmes has been proven through, for example, the Small Business Innovation Research (SBIR) Program in the United States (see Box 5.1). Limitations of such programmes are within the ability to select the most promising projects without rejecting good ones – a staged approach to financing such as in the SBIR allows this, with a relatively loose selection in the first phase, and helping self-select in follow-up phases.

In addition to such direct support policies, there is evidently a need to improve framework conditions, in order to decrease the burden on enterprises linked to dealing with red tape. These framework conditions were discussed in Chapter 2.

Box 5.1. Small Business Innovation Research Program, United States

The Small Business Innovation Research (SBIR) Program was established in 1982, allocating subsidies from federal funds to engage small and medium-sized enterprises (SMEs) in federally funded R&D and increase private sector commercialisation of innovation derived from such funding (Figure 5.2).

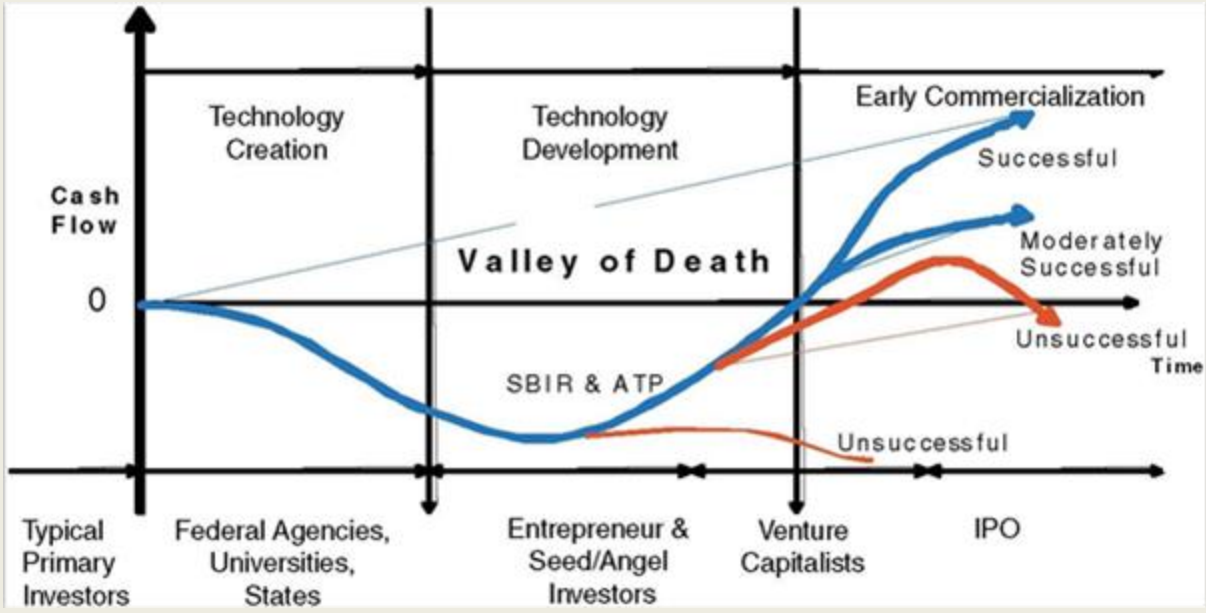
The SBIR has an annual average volume of USD 2.1 billion (2000-10) (over USD 43 billion cumulated from 1982-2015). It allocates over 4 000 awards each year and produces on average 10 patents per day.

SBIR awards can be seen as a "technological probe"; that is, a low-cost means for SMEs to explore the feasibility of their proposed product in a first phase, up to USD 150 000. Successful Phase I then can lead to Phase II financing of up to USD 1 million for R&D. Finally, if Phase II is, in turn, successful and comes up with a viable product, the company can apply for Phase III for commercialisation through follow-on R&D funding from the mainstream budgets of government agencies (not involving SBIR funding).

The phased approach enables the SBIR to create a genuine technological pipeline, funding a large number of projects in Phase I (with small amounts), supporting the promising ones through more substantial Phase II, and finally, ensuring commercialisation for the successful ones in Phase III. Projects are selected on technological merit as well as commercial potential.

The programme has been successful due to the scale and long-term stability of funding. It has thus been able to accelerate novel research, including high-risk R&D, low-cost exploration of opportunities (and dry holes). More broadly, the programme validates technology concepts and commercialisation potential, ultimately attracting additional investments by the private sector (angel, venture capital and large company investments). The SBIR also contributes to the commercialisation of new scientific findings made at universities. The success of the programme has inspired similar initiatives, notably in Japan, Korea, the Netherlands, Sweden, Chinese Taipei and the United Kingdom, and most recently Australia and Canada.

Figure 5.2. Positioning of the SBIR programme on the lifecycle from idea to market



Source: National Research Council Committee for Capitalizing on Science, Technology and Innovation (2008), "Introduction".

5.2.3. Knowledge diffusion and business-academia linkages

Knowledge in and of itself has little economic significance, it is its widespread adoption that unlocks productivity gains and growth. For example, the automobile was invented in 1885, but widespread adoption did not occur until the second half of the 20th century in most countries. Indeed, it is possible to correlate the lag in technology adoption with the lag in per capita income (Nobel, 2012). Innovative SMEs can become or remain competitive in the near term through technology adoption, adaptation and diffusion. Technology diffusion involves the dissemination of innovative technical information and know-how that is already in use in other firms, industries or countries.

Knowledge diffusion is a further key component, and occurs through various mechanisms, such as open publications, open data, international co-operation (such as in foreign direct investment, integration in global value chains and R&D collaborations), commercialisation of public research through spin-offs, and functioning of knowledge networks and markets (OECD, 2015b).

Diffusion is affected by the extent of trade integration in international value chains, foreign direct investment, the mobility of human capital, linkages between business and academia (including international linkages of academia which can facilitate technology transfer to the home country), the use of standards, the extent of business investment in R&D, skills, managerial capabilities, and other forms of knowledge-based capital, among others (OECD, 2017).

Hence a sound innovation ecosystem must have entities, such as technology commercialisation offices (OECD/World Bank, n.d.) or programmes, such as technology and manufacturing extension services (Box 5.2and Box 5.3), as well as various facilitator organisations, such as technology incubators, science parks, competence technology centres that serve to foster knowledge generation, technology transfer and diffusion, in addition to steering research towards industry needs. Commercialisation of inventions from

universities and research institutes; know-how transfer from global knowledge stock, as well as co-creation and co-invention play an important role in greater knowledge generation and moving the technology frontier of a country along with greater use of technology for economically productive purposes.

Box 5.2. Technology extension services

Small and medium-sized enterprises (SMEs) often do not have the capabilities or resources to perform cutting-edge research of their own. However, they can become or remain competitive in the near term through technology adoption, adaptation and diffusion. Technology diffusion involves the dissemination of innovative technical information and know-how that is already in use in other firms, industries or countries. Extension programmes are targeted efforts by government, technical institutes or industry leaders to remove information asymmetries and improve the sector's performance.

Technology extension services (TES) typically do not focus on the creation of new intellectual property and R&D, but rather support firms to catch up and move to the technology frontier, by providing an array of services including: training, advisory services and helplines, obtaining certification, and meeting standards, thus promoting the adoption of know-how in the industry. They also promote technology and knowledge diffusion through the adoption of standards and support in obtaining certification. Some TES include training on modern management practices.

Rigorous impact evaluations have shown that such training can yield substantial improvements in firm performance. In Mexico, a randomised control trial found that the consulting services provided to SMEs yielded an 80% increase in sales and a 120% increase in profits and productivity for treatment firms.

International experience suggests that the following principles should be adhered to when implementing a national technology extension service:

- The TES should be capable of providing guidance, service quality control and analysis of results of activities and services offered at regional and local levels. The TES should therefore be staffed with experts who are familiar with SMEs and the delivery of industrial extension services. It is likely that most academic researchers will not fit the purpose. Forcing academic researchers to be more relevant to industry by changing their incentives has failed in many countries. They can, and should, be part of the TES environment, but cannot be the core field engineers. The ideal candidates must have knowledge of technology and of the business environment of companies, as well as the ability to communicate in interpersonal relationships, since extension services are rendered by means of direct, face-to-face interaction with company leaders and employees.
- The desired impacts of the TES should be achieved by leveraging local and regional resources through wide participation of and collaboration with all sectors of industry.
- The TES should have the analytical capacity to study demand and monitor implementation and assessments at all levels.
- It should have sufficient administrative flexibility to link with the programmes of other agencies and integrate the technology extension programme into the broader (national) innovation policy framework.
- It should be demand-oriented and results-oriented in its entire operation.
- Evaluation of programme performance and its impact should be systematised.

Source: Shapira, P. et al. (2015), Institutions for Technology Diffusion, https://publications.iadb.org/publications/english/document/Institutions-for-Technology-Diffusion.pdf.

A vibrant innovation ecosystem also has policies and instruments such as matching grants, innovation vouchers and tax credits for R&D aimed at deepening university-industry collaboration and fostering greater innovation among businesses.

Box 5.3. The United Kingdom's Manufacturing Advisory Service

The Manufacturing Advisory Service (MAS) is an illustration of a successful extension programme. It provides technical information and specialist support to British small and medium-sized enterprise (SME) manufacturers through a network of nine regional centres. (Scotland and Wales operate similar, but independent, centres). The MAS helps English SME manufacturers increase their competitiveness by boosting productivity and efficiency through the adoption of best-practice manufacturing solutions, particularly around lean manufacturing. Eighty-five per cent of the MAS' work with English SME manufacturers focuses on lean principles. This includes lean on the shop floor, throughout the organisation, and throughout the value or supply chain.

The MAS offers five levels of support services to SMEs.

Level 1 is a free helpline inquiry service, through which manufacturing and business experts are available to answer questions on a range of technical issues.

Level 2 is a free, one-day, on-site manufacturing review whereby MAS manufacturing practitioners assess a firm's manufacturing operations and highlight opportunities to improve operational performance. Those Level 2 diagnostics often lead to additional services at higher levels.

Level 3 includes provision of general awareness training and networking events, including best-practice factory visits.

Level 4 is the MAS' capstone subsidised consultancy support, referred to as "workouts." During workouts, a MAS practitioner spends up to two weeks on-site with the SME instilling competitive manufacturing processes in the firm, including implementing lean manufacturing processes, co-developing value stream and process maps, teaching innovation methodologies, improving shop floor layouts and space utilisation, and introducing sustainable and energy-efficient manufacturing principles.

Level 5 includes referrals of SMEs' "non-manufacturing queries, such as financial, human resources, marketing, legal, or environmental issues," to other providers and programmes within the UK's suite of Solutions for Business. Indeed, the MAS' role is kept primarily to supporting manufacturing operations (and to a lesser extent teaching innovation methods); other programmes help these firms discover new markets, export globally, learn design principles or secure financing for R&D activity. In these cases, the MAS acts as a broker, serving as the central hub for connecting English SME manufacturers to the array of SME support services offered by the UK government.

Source: Ezell, S.J. and R.D. Atkinson (2011), International Benchmarking of Countries' Policies and Programs Supporting SME Manufacturers, https://www.itif.org/files/2011-sme-manufacturing-tech-programss-new.pdf.

Effectively transforming national R&D capabilities into an engine of innovation and growth not only requires an appropriate policy framework and research capacity, but also tools such as technology transfer offices (TTOs) and offices of contract research (OCR). Universities and research institutes are typically the

greatest generators of inventions, followed by innovative industries and businesses. In major universities with prolific research and innovation, activities related to steering intellectual assets towards industry and commercialising the research are typically located in the vice presidency of economic development of the university. The standard practice is for the vice presidency to have two offices – an OCR and a TTO. Both offices, though distinct, perform complementary activities and have strong co-ordination (Box 5.4). A good practice example of such a TTO is described in Box 5.5.

Box 5.4. Offices of contract research and technology transfer offices

Offices of contract research (OCR) provide resources that enhance research and other scholarly endeavours; catalyse relationships with government, industry and private foundations; ensure compliance with university and sponsor policy; and provide oversight of interdisciplinary research programmes, centres and institutes. The principal activities of the OCR are:

- Exploring funding opportunities: Investigating grant sources and various funding opportunities and resources for identifying opportunities that can be beneficial to university researchers.
- Intellectual property management: Helping researchers conducting industry sponsored research or research financed by governments or non-profits negotiate terms of intellectual property ownership.
- Preparing and submitting proposals: The OCR helps researchers in the various steps in developing a research project and preparing a research proposal for submission. The office helps: design and write about projects, build proposals, develop budgets, and advise researchers on the proposal review process in sponsored programmes.
- Award processing: After a sponsor has decided to fund a project, it needs to be reviewed, possibly negotiated and receive an authorised signature. The OCR manages and advises the researchers in the review and negotiation process.
- Material transfer agreements: The OCR is responsible for drafting the terms of the material transfer agreement and ensuring the intellectual property related to it is safeguarded.

A technology transfer office (TTO) is not merely a clearinghouse for the intellectual property generated by research, but rather a critical body that connects the conceivers, generators, adopters, disseminators and consumers of innovation, and effectively commercialises the outputs of research and innovation both nationally and internationally. In addition to their role in commercialising high-tech innovation, TTOs are also vital players in guiding academic research to areas of greatest social and industrial need. The university-industry relationship is a two-way street, and orienting research to the needs of the industry is important in converting the potential scientific value in real economic gains. TTOs also bring global knowledge (through industry relationships and conducting intellectual property analytics) to academic researchers who may be unaware of certain technologies due to severe information asymmetries.

A TTO provides essential commercialisation services to the inventors helping them monetise their research. It is responsible for all steps in the commercialisation of inventions arising from research from the university/institute. They key steps are: soliciting disclosures of inventions; screening (triaging of inventions); determining the commercialisation strategy (licensing/spin-off decision/contract research); executing the commercialisation strategy; monitoring and follow-up (management of royalties, etc.).

Box 5.5. The role of KU Leuven's research and development technology transfer office in the commercialisation of Tenofovir (HIV treatment)

For years, HIV-positive patients were required to take dozens of pills each day, with terrible side effects, for the rest of their lives. Now they have a better treatment option: a single pill, taken once a day. That pill includes a vital compound called Tenofovir, the product of collaboration between researchers at the Rega Institute for Medical Research (at KU Leuven), the Institute for Organic Chemistry and Biochemistry (IOCB) at Prague's Academy of Sciences, and Gilead Sciences. During the past decade, Tenofovir has emerged as a medical breakthrough for HIV, providing treatment that gives patients more life – in both quantity and quality.

When the first AIDS case was documented in 1981, it caught the attention of Jan Balzarini, PhD, who currently heads KU Leuven's virology laboratory. Balzarini has conducted research in KU Leuven's virology laboratory for more than three decades. During most of that time, he worked for the previous head of the lab, Erik De Clercq, M.D. To treat this mysterious virus, De Clercq and Balzarini tested a category of compounds called nucleoside analogues.

Tenofovir was initially licensed to Bristol-Meyers in the late 1980s, but the company lost interest in the compound after merging with Squibb Corp. in 1989 and subsequently returned the intellectual property to the IOCB and KU Leuven. One person at Bristol-Myers did not lose interest, however: John Martin, Ph.D., who went on to become chief executive officer of Gilead Sciences. While at Bristol-Myers, Martin served as a head chemist on the Tenofovir project.

After Martin left Bristol-Myers-Squibb to join California-based Gilead Sciences, he contacted De Clercq and Holý to see if Gilead could obtain the license to Tenofovir. The IOCB and KU Leuven licensed the technology to Gilead Sciences in 1991. KU Leuven's technology transfer office (TTO) facilitated the deal.

Gilead successfully developed a form of Tenofovir that could be taken orally and began selling it in 2001 under the brand name Viread. When used with other antiretroviral drugs, it helps keep the virus suppressed. Viread is now an active ingredient in three single-tablet HIV treatments sold by Gilead: Atripla, Complera and Stribild. Gilead also provides licenses for Tenofovir-based drugs to the Medicines Patent Pool, a United Nations-supported initiative to improve treatment access through patent sharing.

Viread's usefulness extends beyond HIV. In 2008, it received approval as a treatment for chronic hepatitis B virus infection, the most common serious liver infection in the world. "It is now one of the most prescribed treatments for that disease", says Bischofberger. In 2012, sales for Viread (the brand name for Tenofovir) reached about USD 845 million, and sales for Truvada, Atripla, Complera and Stribild (which contain Tenofovir) totalled about USD 8.14 billion. The financial success of those drugs may help fuel further breakthroughs from Balzarini and his colleagues, as Tenofovir licensing royalties come back to the universities and the virology lab.

The funding from licensing income provides a more efficient way to work, Balzarini says, as opposed to research grants, which can constrain researchers' ability to follow a hunch or a new development. Instead, the money from Tenofovir's licensing enables him and his team to pursue the unexpected: "If a new virus comes out tomorrow, we can, in a very dynamic way, more easily address emerging problems".

Source: KU Leuven (2013), The Importance of Technology Transfer, https://autm.net/about-tech-transfer/better-world-project/bwp-stories/tenofovir-disoproxil-fumarate

5.3. Structure of the business sector

5.3.1. Ownership structure: The industrial sector is dominated by large state-owned enterprises while non-oil manufacturing and services are largely private

In the period following the independence, Kuwait established state-owned enterprises (SOEs) as vehicles for implementing the welfare state, in particular in areas of natural monopolies, where a single-firm arrangement is seen as the most efficient arrangement, and where providing monopoly rents to a private entity would not seem appropriate. The nationalisation of the oil sector occurred in the 1970s and significantly reinforced the SOE sector. Stock market crashes in 1976-77, and another in 1982 drove further state share purchases in the banking, insurance and real estate sectors. At its peak in 1990, the state had shares in 61 of Kuwait's largest companies, accounting for 70% of the market capitalisation of the corporate sector. Following the Iraqi invasion and the resulting strain on the budget, a wave of divestitures followed in the 1990s, through auctions and initial public offerings (Sartawi, 2012[177]).

A major feature of the Kuwaiti economy is the extreme concentration of the value added in the state-owned enterprises, with 34 SOEs (0.08% of the total in the survey)[1] accounting for nearly 5% of employment and 56.4% of the value added. Specifically, it is the dominance of the state-owned industry sector which is visible not only within the industrial sector, but for the economy as a whole, as 15 establishments (0.04% of the total) account for nearly 54% of the overall gross value added. Within those, the four establishments within extraction and refining of crude petroleum represent the lion's share (53.2% of the total). The non-oil industry is dominated by the private sector; SOEs are found in the chemicals, rubber, and food and beverages sectors, but they produce only a fraction of the gross value added of the private sector and employ few people (Table 5.1).

Due notably to the weight of the oil sector and utilities,[2] the value added per employee is extremely high in the SOE sector, especially in industry (KWD 516 911/person on average, and in the oil extraction sector as high as KWD 931 150/person).

The share of services has been progressing in the Kuwaiti economy, increasing from 38.5% of the total value added in 2010 to 51.1% in 2016. The shift to services of the economy is a pattern observed in most OECD countries: after a protracted period of increase, the share of services has stabilised at about 75% of the economy, while in the resource-based Gulf Cooperation Council (GCC) countries, the share of services is still increasing, ranging from 47% in Qatar to 60% in Bahrain in 2016.

Within services, the private sector dominates, even though SOEs are present in strategic sectors such as finance, telecommunication, and air and sea transport. Kuwait Finance House and Zain (telecommunications) are Kuwaiti SOEs ranking among MENA's 100 largest listed companies (OECD, 2019a). Kuwait Airways and Kuwait Oil Tanker Company are also very significant and strategic state-owned companies.

Kuwait has a relatively thriving stock market, with 175 listed companies and a market capitalisation equivalent to 77% of gross domestic product (GDP) in 2018, one of the highest within the GCC, and indeed within the whole MENA region. A sizable proportion of trade (40%) takes place between retail investors. Nevertheless, the market capitalisation is strongly concentrated in the banking and financial sector (57% of the total), followed by the telecommunications sector (11%). Petrochemicals represent only 1% of the market capitalisation, while in Saudi Arabia it represents 25%. MSCI classifies Kuwait as a frontier market.

MSCI Inc.[3] used to classify Kuwait as a "frontier market",[4] alongside Bahrain and Jordan, while Qatar, Saudi Arabia and the United Arab Emirates were classified as emerging markets. Owing to the modernisation of the trading infrastructure, MSCI announced the upgrade of Kuwait to emerging market status as of June 2020 (Pacheco, 2019).

Table 5.1. Business structure as measured by the Survey of Establishments, 2016

		Industry		Services					
		Oil and petrochemicals	Industry, non-oil	Trade	Construction	Non-financial services	Financial services	Non-profit	TOTAL
Establishments	Public, units	4	11	4		8	5	2	34
	Public, % of total	0.01%	0.03%	0.01%	0.00%	0.02%	0.01%	0.00%	0.08%
	Private, units	5	5 516	23 592	1 494	9 974	447	123	41 151
	Private, % of total	0.01%	13.39%	57.28%	3.63%	24.22%	1.09%	0.30%	99.92%
Employees	Public, units	20 917	5 658	2 027	0	12 324	2 258	15	43 199
	Public, % of total	2.40%	0.65%	0.23%	0.00%	1.41%	0.26%	0.00%	4.95%
	Private, units	7 832	115 255	192 145	184 762	289 337	33 685	5 920	828 936
	Private, % of total	0.90%	13.22%	22.03%	21.19%	33.18%	3.86%	0.68%	95.05%
Gross value added	Public, million KWD	13 560	176	49	0	232	348	0.09	14 366
	Public, % of total	53.23%	0.69%	0.19%	0.00%	0.91%	1.37%	0.00%	56.39%
	Private, million KWD	128	1 350	1 596	987	3 881	3 134	34	11 111
	Private, % of total	0.50%	5.30%	6.26%	3.87%	15.24%	12.30%	0.13%	43.61%
Gross value added/employee	Public, KWD/person	648 306	31 159	24 108	x	18 830	154 148	5 933	332 554
	Private, KWD/person	16 365	11 716	8 306	5 342	13 415	93 036	5 711	13 404

Notes: The percentages are calculated on the basis of all enterprises surveyed, which does not necessarily represent the entire Kuwaiti economy. The enterprise census on which this survey is based has significant gaps, in particular for enterprises established since the last business census in 2008, and coverage of companies below 20 employees is sporadic. Thus, the total number underestimates the full population of establishments.
Source: Data from KCSB (n.d.).

5.3.2. The untapped potential of small and medium-sized enterprises

Worldwide, SMEs have proven to be a very efficient channel to accelerate the pace of economic and social development. Due to lower organisational and operational complexities, SMEs provide a fertile environment for training workers and developing their skills and help speed up the turnover of small amounts of invested funds. SMEs can provide valuable employment opportunities to a growing young population, improve productivity and help diversify the economy. They are also attractive because of the simplicity of their establishment and administrative structure, since usually only a relatively small amount of capital is needed for initial foundation and operation. In its most frequently chosen legal form, the limited liability allows them to exit the market with little significant impact.

SMEs account for 99% of firms in OECD countries, approximately 60% of employment and 40-60% of value added across these countries. Their share in GDP represents 49% in Austria, 42% in France, 49% in Japan, 57% in Spain and 45% in the United States (OECD, 2019b).

SMEs can also help economies and societies adapt to major transformations, such as digitalisation, globalisation, ageing and environmental pressures. The creation of new business ventures and innovation in existing SMEs are critical parts of today's innovation process, and should have a central place in government strategies to promote innovation. The 2018 OECD Ministerial Conference on SMEs, in its Declaration on Strengthening SMEs and Entrepreneurship for Productivity and Inclusive Growth, calls for "*governments to enhance SME participation in the national and global economy and enable SMEs to make the most of the digital transition. It underlines the importance of access to appropriate forms of finance; entrepreneurial opportunities for all segments of the population; entrepreneurship education and training and upskilling of entrepreneurs and workers; and multi-stakeholder dialogue on effective policies*".

Although productivity in SMEs tends to be lower than in large enterprises, they are the major engine of job creation and growth (OECD, 2019b).

The role of SMEs in the Kuwaiti economy has been modest, with large companies in the oil industry and the public sector being the leading contributors to GDP. Although statistical data on SMEs are lacking due to an absence of an official definition (Box 5.6), the World Bank estimates that the number of SMEs in Kuwait amounts to 94% of the total number of enterprises, but their overall contribution to the economy is marginal: just 3% of total GDP (Abukumail, Karam and Al-Otaibi, 2016). A similar result was obtained by a recent study by KISR, which concluded that micro, small and medium-sized enterprises (MSMEs) represent 95% of all enterprises, 8.6% of non-oil GDP and about 16% of total employment.[5] Moreover, the study concludes that MSMEs are stagnant, with an employment growth of just 0.5% per annum, and a real output growth of 1.1% per annum between 2003 and 2012. Only 150 MSMEs (less than 0.4% of the total number) provided any training (Ramadhan, Girgis and Al-Fulaij, 2018). Moreover, the objectives of the Kuwaitisation policy have also not been met, since the (very low) fraction of Kuwaitis employed within SMEs has further decreased, from 3.1% in 2003 to 2.5% in 2012.

Thus, the SME sector is currently not a significant contributor to achieving the Kuwaiti government's economic diversification objectives.

UNDP estimates indicate a relatively low SME concentration of one SME per 43 nationals as compared, for example, to Saudi Arabia, which has one SME per 25 nationals (UNDP, 2011).

Box 5.6. Definition of Small and medium-sized enterprises in Kuwait

In 2018, the government , adopted a new definition (Law 14/2018) for SMEs, according to which:

1. Small enterprises: are independent entities in which the number of employees does not exceed 50, assets are below KWD 250 000 and revenue generated is below KWD 750 000. If the enterprise is linked to another entity, the number of employees, assets and revenues of the combined entities need to meet the criteria above.
2. Medium enterprises: are independent entities in which the number of employees is between 51-150 employees, assets below KWD 500 000, and revenue generated is below KWD 1.5 million. If the enterprise is linked to another entity, the number of employees, assets and revenues of the combined entities need to meet the criteria above.

Previously the definition was quite different, and a small firm was defined as one with a start-up capital lower than KWD 25 000, with 1-4 Kuwaiti national employees, and a medium company as a company with KWD 25 000-500 000 in capital that employs 5-50 Kuwaiti nationals. This definition, created by the SMEs Law 98/2013, excluded 88% of small enterprises in the country that do not employ Kuwaitis and also defines firms with a large number of employees as small because they employ few Kuwaiti nationals. By contrast, Kuwaiti banks followed varying criteria in defining small and medium-sized enterprises (SMEs), using annual revenue or paid-up capital or a combination of the two indicators. The lack of a uniform definition made it difficult to accurately estimate the true contribution of SMEs to Kuwait's economy.

The adoption of a new uniform definition which does not depend on the nationality of workers is a step forward and will facilitate better understanding of the contribution of SME's to the Kuwaiti economy.

Sources: Ramadhan, M., M. Girgis and S. Al-Fulaij (2018), SMEs in Kuwait: Summary report - Small and medium enterprises in Kuwait: Their Impact and the Way Forward, https://www.kfas.org/media/1d025bcb-e3ea-4763-8b89-3b27c32680bd/EL8atw/StudiesResearchers/Files/Small%20and%20Medium%20Enterprises%20in%20Kuwait%20-%20Report%20Vol%20I.pdf; Al-Alawi, A.I. and F.M. Al-Ali (2015), "Factors affecting e-commerce adoption in SMEs in the GCC: An empirical study of Kuwait", http://dx.doi.org/10.3923/rjit.2015.1.21.

The Law on Commercial Companies stipulates that the majority of any business has to be owned by a Kuwaiti national (with the exception of free zones, or investments under the so-called 'KDIPA law' where 100% foreign ownership is permitted, but this does not apply to small and medium enterprises). This is clearly a significant barrier to enterprise creation for expatriates, who represent two-thirds of the resident population.

As regards Kuwaiti nationals, they need to forego lucrative employment in the government sector if they wish to start a company. The National Fund for SMEs can provide financing for such ventures, but only under specific rules, notably precluding equity ownership by non-Kuwaitis. This will be discussed in Section 4.6.2.

As discussed in Chapter 2, general business climate conditions are not favourable in Kuwait, and this poses a hurdle for SMEs in particular. In a World Bank survey on 502 SMEs completed in 2014, more than 35% noted that licensing, permits, labour regulation, regulatory uncertainty and corruption were the main hurdles and bottlenecks to the development of SMEs in Kuwait. About 24% of the surveyed companies also noted that they felt that the workforce was not sufficiently skilled. As noted in the survey, dealing with governmental regulations takes roughly 15% of a manager's time, leading to another roadblock in establishing a business (Abukumail, Karam and Al-Otaibi, 2016).

The start-up ecosystem

Entrepreneurs fuel economic growth, as new companies bring vitality to the economy through new ideas, products and processes, and fostering "creative destruction". As discussed in Chapter 2, incentives in favour of entrepreneurship are relatively weak, and framework conditions still unfavourable.

However, a young generation of Kuwaitis who has mostly been trained abroad is bringing new ideas and initiating a fledgling start-up ecosystem in Kuwait. Role models are Talabat and Carriage, two online services companies which have been quite successful. Their founders were able to exit their investments profitably through a sale to a foreign entity:

- Talabat is a food-ordering platform established in 2004, and sold to the German company Rocket Internet for USD 170 million in 2015 – the largest exit in the MENA region until then.
- Carriage is a food delivery company which started in Kuwait, and subsequently expanded to the United Arab Emirates, Bahrain, Qatar and most recently to Egypt. It was acquired by the German multinational Delivery Hero in 2018 for about USD 100 million (Hamid, 2019).

These success stories raised awareness among Kuwaitis that entrepreneurship was possible in Kuwait as well.

This triggered a wave of Internet-based start-ups launched and funded in 2017 and 2018, including: Jumla Club, a business-to-business food and beverage platform; Nalbes, a fashion retail site; COFE, a marketplace focused on coffee; InstaSalla, an e-grocery company; Tabeeby, a healthcare technology platform; and Ajar online, a fintech allowing tenants to pay rent online. COFE was the only Kuwait-based start-up listed as one of the "Top 50 Start-ups to Watch in the Arab World" by FORBES Middle East. Even more numerous are those in pre-seed stage, vying for initial financing, such as Li3ib, a sports facility management company; P5M, an app to find and select gyms; Scrrap.com, a platform for car parts; and many others.

There are few examples of entrepreneurship based on "hard" technology. One such example is Meshari oil remediation, which addresses a very specific environmental issue (Box 5.7).

Box 5.7. Meshari oil remediation

Dr Meshari Al-Mutairi's novel oily sand remediation technology was recently contracted by the Kuwait National Petroleum Company (KNPC) in a breakthrough project to treat a legacy problem. Dr Al-Mutairi has devoted his life to improving Kuwait's environment and was awarded 1st place out of 150 candidates at the 2018 Geneva International Exhibition of Inventions. The damage inflicted on Kuwait's environment from the destruction of the oil production infrastructure due to the Iraqi invasion motivated him to address the problem of oil sand remediation. Experiencing family members suffering from cancer likely contracted from extended exposure to the damaged ecosystem strengthened his resolve and he received his PhD from Portsmouth University and wrote his thesis on oil sand remediation. Dr. Al-Mutairi focused on the basic process of oil sand washing. Oil sand washing is a process practiced by many companies, but Dr. Al-Mutairi took the basic process and made several critical improvements to make it more efficient and economical. Dr. Al-Mutairi worked closely with the Sabah Al-Ahmad Centre for Giftedness and Creativity (SAC) to obtain patent protection for his innovation and he personally financed a pilot project with the KNPC. He applied his process on samples of contaminated soil and cleaned it to where it was certified by both the KNPC and the Kuwait Oil Company as compliant with both national and international standards for cleanliness.

It took Dr. Al-Mutairi three years of persistence to bring his technology to where it is now, ready for a commercial application. Dr. Al-Mutairi is working with the SACGC and the National Technology Enterprises Company and is on the brink of initiating a major project with the KNPC to remediate 64 000 tonnes of contaminated soil. The National Technology Enterprises Company will invest KWD 750 000 to support the capital expenditures for the project and will establish a joint venture in partnership with Dr Al-Mutairi to commercialise his technology throughout the Gulf Cooperation Council region. It is estimated that there is a market of several hundred million KWD in the region.

Source: Based on interviews with Dr Al-Mutairi.

Another promising area is medical technology, where a number of patents have been filed, and one has been commercialised through licensing. A group of medical doctor inventors has been mobilised by NASCO, a subsidiary of the National Technology Enterprises Company (NTEC), to create a Centre for Medical Innovation. Examples of inventions by those doctors include: a novel biodegradable balloon system used in kyphoplasty (spine surgery); an arterial internal guide needle deployment and suturing device, an innovative arterial puncture and closing device; sinus venosus atrial septal defect percutaneous treatment device enabling treatment of cardiac catheterisation without a surgical intervention. However, this initiative has not managed to rally support from the Ministry of Health.

The Berkeley Research Group published a report based on interviews with 35 Kuwaiti entrepreneurs located in Kuwait or in Dubai (Berkeley Research Group, 2017), identifying five archetypes according to present and future location:

- "Homebound for Now": 12 companies born in Kuwait and focused on operating in Kuwait for the time being. These companies mostly focus on the domestic market (9/12), and only 3 have regional (GCC) ambitions. They quote market opportunities, lifestyle and the "workforce support" supplement as key factors.
- "Looking Around": four companies born in Kuwait and considering relocating. They, too, mostly focus on the domestic market, yet discontent with the business environment, are looking elsewhere.

- “Springboard”: seven companies born in Kuwait that split operations to grow. These companies are mostly targeting GCC markets (5/7), while two target global markets. These companies value talent and government regulation more than the previous two categories.
- “Moving Out”: three companies born in Kuwait that relocated their headquarters. Similar to the previous category, they focus on the GCC and global markets, and value talent and government regulations above all.
- “Born Abroad”: nine companies founded by Kuwaitis outside of Kuwait. They also target the GCC and global markets, and care about markets, lifestyle, government regulation and talent.

The businesses located in Kuwait quote market opportunities and the “workforce support”[6] supplement as key supporting factors, while those who operate in Dubai quote access to regional markets, talent and the role of government as setting favourable conditions. Market opportunities score 4.6/10 for Kuwait and 7.7/10 for Dubai, while for talent Kuwait scores 3.8 and Dubai 7.3. The best Kuwaiti score is for access to finance, where Kuwait scores 6.2, still lagging Dubai at 7.3.

Interestingly, none of the entrepreneurs quoted technology and research as a decisive factor, and this dimension also scores the lowest of all dimensions (2.4 for Kuwait, 5.3 for Dubai). Similarly, intellectual property protection was not quoted as paramount, and scores very low (3.1 in Kuwait, 5.2 in Dubai).

There are a number of private sector incubator and accelerator programmes active in Kuwait, such as Reyada, Cubical, Niu, Sirdab Lab, Startup Q8 and Brilliant Lab. They typically offer co-working space, events (including networking events, boot camps and workshops), as well as mentorship services (help with business development, product-market fit, development plans and others). One of the most advanced programmes for entrepreneurs is that of Zain Great Ideas with Brilliant Lab (Box 5.8).

Entrepreneurs have a range of maturity stages – from the exploratory stage (pre-idea) through the planning stage (have an idea but need to understand customers’ needs), the building stage (have employees, looking for funding) and expansion (revenue stage, looking to grow).

Box 5.8. Zain Great Ideas

Zain is a leading Kuwaiti mobile and data services operator with a commercial footprint in 8 Middle East and North African countries with a workforce of over 7 000 providing a comprehensive range of mobile voice and data services to over 49.5 million active individual and business customers as of 31 December 2019.

Since 2010, Zain has been supporting youth entrepreneurs in Kuwait to accelerate development, incubate and connect with investors through the Zain Great Ideas programme.

1. 2010-2011, Zain Great Ideas focused mostly on supporting the creation of business plans.
2. 2012-2014, it expanded its services to include coaching, networking and international experience as well as support on project financing and investment pitch.
3. Since 2015, it has also provided expert support and advice in addition to support on project financing, approach to investors and investment pitch.

Thus far Zain has supported four cohorts – 2010 (ZGI 1), 2013 (ZGI 2), 2015 (ZGI 3) and 2017 (ZGI 4) and 2019 (ZGI 5). While in the first cohort, hardly 1% of applicants were tech firms, almost 100% of applicants in last two cohorts have been tech firms. Since inception of the programme, Zain Great Ideas has received more than 1 000 ideas. The 70+ awardees have received special corporate deals, in-kind services and hosting at Zain headquarters.

ZGI 5 had nearly 100 participants in the boot camp, which lasted 4 weeks from mentors including successful Kuwaiti entrepreneurs as well as academia from Stanford University and IE Business school. The 10 finalists went for an accelerator programme in San Francisco, United States, with Brilliant Lab, a Kuwaiti start-up acceleration service provider and Mind the Bridge, an innovation advisory firm based in Silicon Valley. They had the opportunity to visit Google and Microsoft, and get feedback on their business plans from Silicon Valley investors. Following the programme, the entrepreneurs still have access to consultations, mentoring and business contacts from Zain's team.

From the ZGI 4 programme, 8 out of 12 finalists are turning a profit, and were able to raise USD 1/5 million in additional capital. An average of 40% of all ZGI participants of the past four programmes are still up and running businesses to date. All applicants are tech companies, with a large number of marketplaces (28% in ZGI 4), e-sports (18%), as well as e-health, fintech, e-recruitment, e-logistics, e-food and cloud services. Success stories include **tktti**, an integrated online ticketing platform, **bookr**, a booking app for salons, spas and wellbeing, and **bleems**, a flowers and gifts order delivery app.

Zain has only become visible in the last two years and has never received any support from the government.

Source: Interviews with Zain management, (Zain, 2020).

Entrepreneurs that the review team interviewed were mostly young and educated in foreign countries. Their motivation is to "make history" rather than to make money, and some of them quit their well-paid government jobs to become entrepreneurs, in a quest of meaning of life.

The barriers quoted include bureaucratic hurdles to licensing (up to nine months to get a license), delays with customs clearance for imports and exports, dearth of talent (in particular software developers), and hurdles for foreign investors – even GCC nationals are not treated equal to Kuwaitis.

Interviews held by the review team with incubators in Kuwait confirm the findings of the Berkeley Research Group about entrepreneurs often starting up in Kuwait, then moving out, either to Dubai for market and regulation reasons, or to Egypt for reasons of costs and ease of hiring.

Overall, specific policies aimed at fostering entrepreneurship are non-existent, and overall entrepreneurial support ecosystem in Kuwait is weak. The National Fund for SMEs (Box 5.9) and the Industrial Bank of Kuwait (Box 5.10) are the two prime institutions financing SMEs. While the Industrial Bank of Kuwait mostly focuses on working capital[7] and is not restricted to SMEs or the private sector, the SME Fund was created specifically to provide seed capital to private start-ups. The role of the National Fund for SMEs will be further discussed in section 4.7. below.

Box 5.9. The National Fund for SME Development

The government established a National Fund for SME Development in 2013, as an independent public corporation with a capital of KWD 2 billion. Its objective is to help Kuwaiti entrepreneurs create small and medium-sized enterprises and increase their participation in the growth and development of the private sector.

At the outset, the National Fund was set to provide soft loans of up to KWD 250 000 to small (at least two Kuwaiti employees), and KWD 500 000 to medium-sized (five or more Kuwaiti employees) enterprises, with an interest rate of 2% and no collateral requirement. Submitted business plans are evaluated by four local banks and the internal evaluation team, backed up by an external technical committee and the board. A default rate of 80% is projected on the companies financed by the loans.

Relatively few loans were disbursed in the initial years, but since new management was brought in with private sector experience in 2017, operations have started running more smoothly, with a 40% approval rate of loans. A total of 400 projects have been funded to date. Companies funded are mostly from the commercial sector (40%), services (35%), industrial (17%) and handicrafts (5%). The fund has a three-month training programme, often attended by people who have been rejected for loans.

Equity instruments for early stage start-ups have been considered, but not yet implemented.

Source: Interviews with National Fund management.

Box 5.10. Industrial Bank of Kuwait

The Industrial Bank of Kuwait (IBK) was established in 1973 by the initiative of the government of Kuwait and the private sector. It is a specialised bank dedicated to supporting industry in Kuwait, providing medium- and long-term financing for the establishment, expansion and modernisation of industrial firms in the country. It also offers a full range of commercial banking facilities to meet the working capital needs of its industrial customers.

The IBK manages the Al-Senai (Industrial) Portfolio for Small Enterprises. The KWD 50 million funds for this portfolio were provided by the Kuwait Investment Authority under Law 10/1998 and the IBK manages it for them.

The fund supports entrepreneurs with Islamic financing for the purchase of equipment of up to KWD 500 000 (80% financed), but does not finance the working capital. Most entrepreneurs who approach the IBK Fund have ideas at a very early stage, and do not yet have a registered company. The IBK provides mentorship in addition to finance to these entrepreneurs. Most entrepreneurs are in the food business, but recently there has been an uptick in app developers. Entrepreneurs are expected to leave their daytime jobs if they have one, and the rules require that 100% of the shareholders must be Kuwaitis.

The IBK has a good track record, with 700 financed projects and a failure rate of just 10% over the life of the fund (20 years).

Source: Interviews with IBK management.

5.4. Innovation in the business sector

In order to understand the innovation performance of the Kuwaiti business sector, a dedicated innovation and R&D survey was conducted in Kuwait in 2018 (Box 5.11).

Overall, 43% of Kuwaiti companies confirm having innovated in either product, process, marketing or organisational structure in the three years from 2015 to 2017. The propensity to innovate strongly depends on size, as shown in Figure 5.3.

Partially or totally state-owned enterprises report a higher rate of innovation (respectively 61% and 53%) than privately owned ones (42%). This difference can partly be attributed to the size, since SOEs are large enterprises.

Conversely, when asked about the share of turnover from innovative products, SOEs report a smaller fraction (47%) than mixed ownership companies (62%) and private companies (61.5%). This would suggest that SOEs do have innovation activity, but that the market impact of it is less than in the private sector.

Box 5.11. Methodology of the dedicated innovation and R&D survey

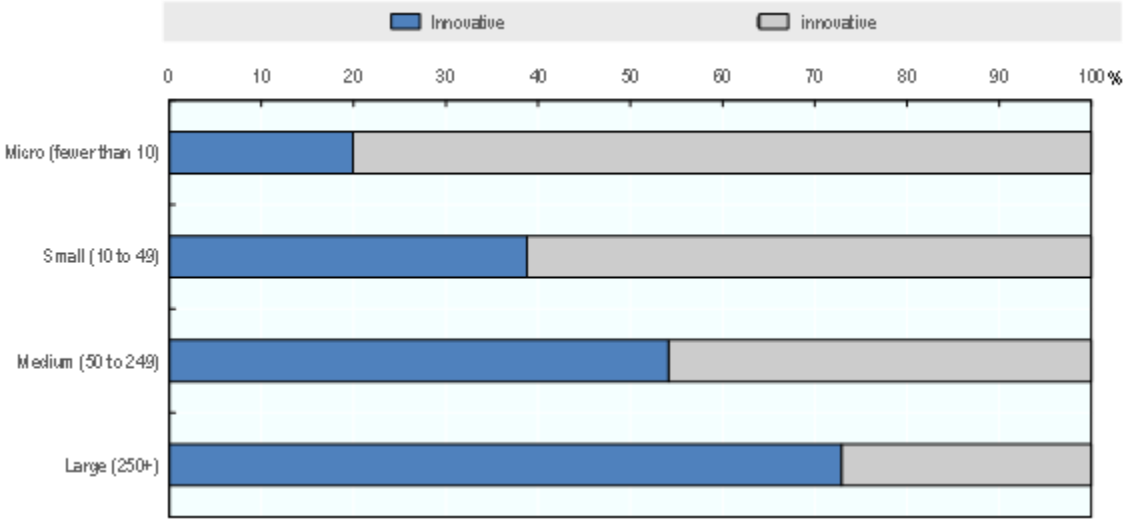
The innovation and R&D survey was carried out by the Kuwait Central Statistical Bureau (KCSB) and the Kuwait Foundation for the Advancement of Sciences in 2018 and 2019 (two campaigns), with methodological support from the GOPA consulting company, based on their expert experience with the surveys conducted by the UK Office for National Statistics and within the Gulf region. The innovation part of the questionnaire was based on the European Community Innovation Survey questionnaire using international guidance contained within the OECD *Oslo Manual* (OECD/Eurostat, 2005). The R&D part of the questionnaire was based on the 2015 OECD *Frascati Manual* (OECD, 2015a).

Sampling

Quality issues exist with the list of businesses held by the KCSB. As a consequence, all available companies in the KCSB directory with 20 or more employees were selected, amounting to 2 350 companies. This was complemented by a sample of companies with ten or more employees sampled from the database of 4 427 available companies in total. The target sample was 3 000 companies. A total of 2 154 companies provided valid responses. An additional sample of 200 companies were taken at random from 270 companies that were said to be less than ten years old provided by an independent provider – Cedar Rose. A total of 172 companies provided valid responses to this additional collection. The reference period for innovation and R&D behaviour was three years (2015-17).

Note: The OECD team was informed about a more limited innovation survey conducted by KISR and KDIPA on a sample of 397 enterprises covering five sectors. However, the results of this survey were not made available.

Figure 5.3. Innovativeness by company size, Kuwait



Note: The blue bar denotes the percentage of enterprises declaring having innovated in 2015-17.
Source: Kuwait Innovation Survey 2018/19.

Sectoral analysis shows strong innovation performance in the mining and quarrying sector (100% of a sample of three companies innovate). Significant R&D activity exists in Kuwait Petroleum Corporation (KPC) and its subsidiaries[8] (in particular, Kuwait Oil Company), based on co-operation with external

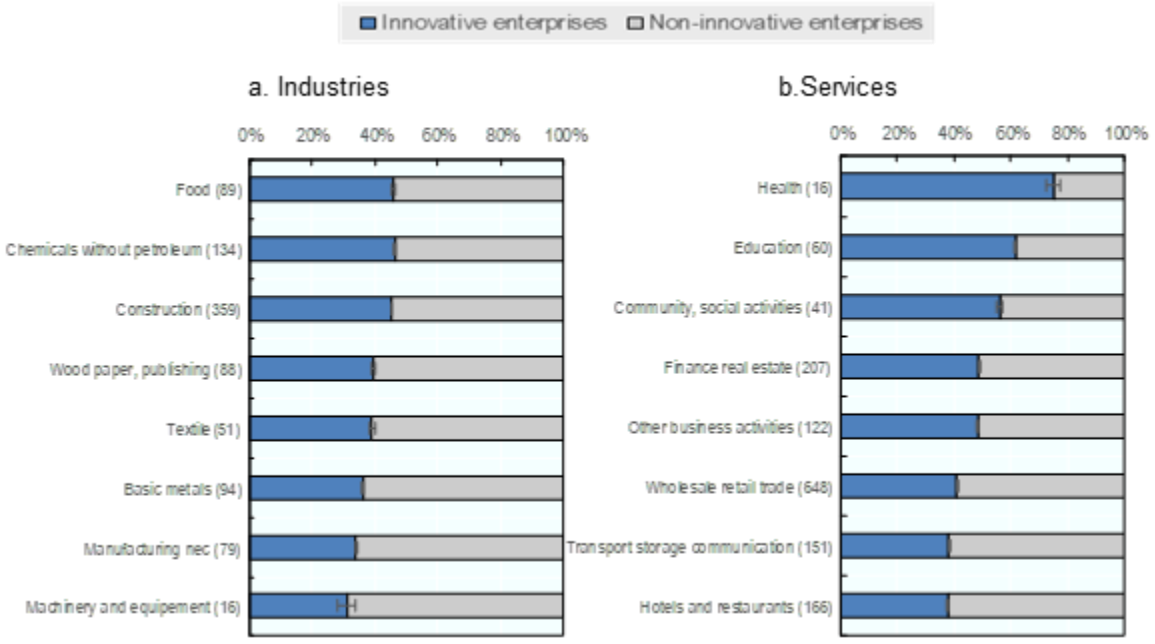
partners such as Schlumberger, as well as KISR (Box 5.12). The KPC is aiming to establish its own fully-fledged R&D centre by 2023. Other innovative sectors in industry include food, chemicals, utilities and construction, with more than 40% of innovative companies (Figure 5.4).

Among the services sectors, the most innovative is health (75% of a sample of 16), followed by education (62% of a sample of 60), as well as community and social (56% of a sample of 41).

Among other expenditures, the most common ones were the acquisition of machinery and equipment (35% of the businesses), design (18%), training (17%), and the acquisition of knowledge (10%).

Only 31 companies (representing 3.1% of the innovating companies) have received external financial support for innovation activities. Of these, 13 have been supported by KFAS, 9 by the Public Authority for Industry for customs exemptions and 4 from the Industrial Bank of Kuwait. Only one company mentioned the National Fund as a source of support.[9]

Figure 5.4. Innovation performance per sector in Kuwait



Notes: The left-hand graph represents sectors in industry, and the right-hand one-service sectors. The blue bar denotes the percentage of enterprises declaring having innovated between 2015 and 2017, per sector. The number in parenthesis next to the sector name represents the sample size in each sector.
Source: Kuwait Innovation Survey 2018/19.

Box 5.12. Research and development at Kuwait Petroleum Corporation

Kuwait Petroleum Corporation (KPC), founded in 1980, is the state-owned enterprise group in charge of oil exploration, refining and transport, as well as the transport of natural gas. KPC subsidiaries (also collectively known as "the K-companies") include Kuwait Oil Company (KOC), Kuwait National Petroleum Company (KNPC), Petrochemicals Industry Company (PIC) and Kuwait Oil Tanker Company (KOTC). Consolidated revenues reached KWD 24.9 billion (USD 81.7 billion) for fiscal year 2017/18.

The KPC is in the process of establishing the Kuwait International Petroleum Research Centre (KIPRC) as an internal R&D centre for K-companies, to be launched in 2023. This was originally planned as a strategic alliance with the Kuwait Institute for Scientific Research (KISR), but the negotiations failed, and therefore the KPC is establishing it as an internal R&D centre. Additional partnerships will be sought for the KIPRC.

The KPC's R&D Strategy focuses on developing in-house R&D1 in the upstream activities linked to:

- Steam flood technology for improved oil recovery and heavy oil production in co-operation with Chevron Saudi Arabia.
- Tight (low productivity) reservoirs simulation, which should help convert these stranded resources into producible reserves. For this, co-operation with Schlumberger, Baker Hughes and Halliburton is foreseen.
- Corrosion mitigation technologies to prevent pipeline degradation.
- Best practices in well delivery process, performance management, well engineering and operations.
- Production optimisation, including flow assurance and applying best practices of digital oilfields.
- Water management, including water control techniques, e.g. gels, permeability modifiers, inflow control devices and intelligent completions.

For downstream activities, it is planning a virtual R&D centre, and is developing collaboration with research institutes and universities. Their collaboration extends to universities abroad and includes Delft, Cambridge and Imperial College. Domestic co-operation includes KISR as a partner in downstream activities, including solar energy, for a 1.5 GW plant, in order to implement the Amir's vision of 15% renewable energy by 2030. However, the KPC believes that there is room for improvement for KISR due to a "brain drain" towards the KPC and its subsidiaries. The KPC also projects to sign a co-operation agreement with KFAS in order to facilitate access to international universities.

However, the main challenge for the KIPRC is the hunt for talents in order to ensure staffing. Originally planned to be staffed by 700 people, the number has been revised to 400. Kuwaitisation ratios pose an issue, because the KIPRC has to bring in foreign talent.

Kuwait Oil Company

The KOC is building on know-how it has acquired over the past, collaborating with international oil majors: British Petroleum and Shell are sharing best practices with the KOC, and the company also has a strategic partnership with Schlumberger as a key supplier (KWD 100 million contract).

The Research and Technology (R&T) Division of the KOC does not do mainstream R&D, but works with new and emerging technologies and technologies that need to be transferred into the KOC from external sources. The work is guided by a roadmap and search for solutions to the challenges identified

– 81 live projects today with a budget of approximately KWD 10 million per year. The KOC has partners who inform it about opportunities, visit key research and innovation centres around the world.

R&D started in the KOC in 2015 with about 50 people; in 2019 there were 150, ultimately to be transferred to the KIPRC. KOC R&D has several partnership agreements, including the above-mentioned contract with Schlumberger. Additional partnerships will be sought for the KIPRC.

Digitalisation is an area of focus, within a project called "KOC to D&I". A digital tracking system for the oil wells tracks operational problems. Another part is a digital reservoir model, as an intelligent decision support to enable better exploitation decisions, including enhanced oil recovery.

The KOC has in-licensed more than 300 software licences. It also develops its own software with a team of 30 developers. Some of that software is copyrighted (about 100 computer programmes). However, this software is not being licensed out, and the KOC does not see this as a business line. It also applies to "digital oilfields" which are for internal use only. The KOC won the 2013 ADIPEC award for the Best Gas & Oil Innovation for the Kuwait Intelligent Digital Field in Sabriyah.

The KOC started an employee innovation initiative in 2016, through the "Idea to Life" programme, which has the objective of capturing ideas within the KOC, evaluating them, and registering and implementing them within the KOC if relevant. The implementation of "Idea to Life" was to be implemented in 2018 as a pilot in the R&T Division, later to be rolled out across the KOC. An app is foreseen to enable online submissions; an award is also foreseen (one already exists for Hygiene, Security and Environment ideas within the KOC). A KPC committee is brainstorming with all K-companies on how to implement such initiatives.

Sources: Interviews; Kuwait Oil Company (n.d.), Upstream Centre of Excellence, https://www.kockw.com/CoE/Main.html.

However, due to the business demography, innovating enterprises are more numerous in wholesale and retail trade (26%), construction (16% together), and finance real estate (10%). Other sectors represented include education, food, wood and paper, chemicals, basic metals, textile, manufacturing n.e.c., machinery, and mining and petrochemicals (the latter sector has few very large corporations).

Innovation in the banking sector is strongly encouraged:

- In a circular sent to banks in October 2019, the Central Bank of Kuwait instructed all banks to prepare their 'shaping the future' strategies clearly specifying how do they intend to face the challenges (including technological developments ones), include how they will invest in better understanding of their customers expectations and needs during the next 3-5 years. It also asks the banks to establish a department concerned with fintech and innovation, in addition to a department for strategic planning.
- The Central Bank also created a sandbox which allows for fintech experimentation, as well as a Centre of Excellence to foster innovation within the Central Bank itself.
- The Institute of Banking Studies (IBS) encourages research (along with the CBK) by having a yearly award for best research paper with the "Kuwaiti Economic Researcher Award" and the "Kuwaiti Economic Student Award."

About 22% of innovating companies have developed goods innovations, and 41% have developed services innovations, while 32% have developed both goods and services innovations. Unsurprisingly, industrial sectors are more inclined to innovate in goods, while service sectors innovate in services. However, a large proportion of industrial companies are also innovating in services, as well as a number of firms in the services sectors innovating in goods (Figure 5.5).

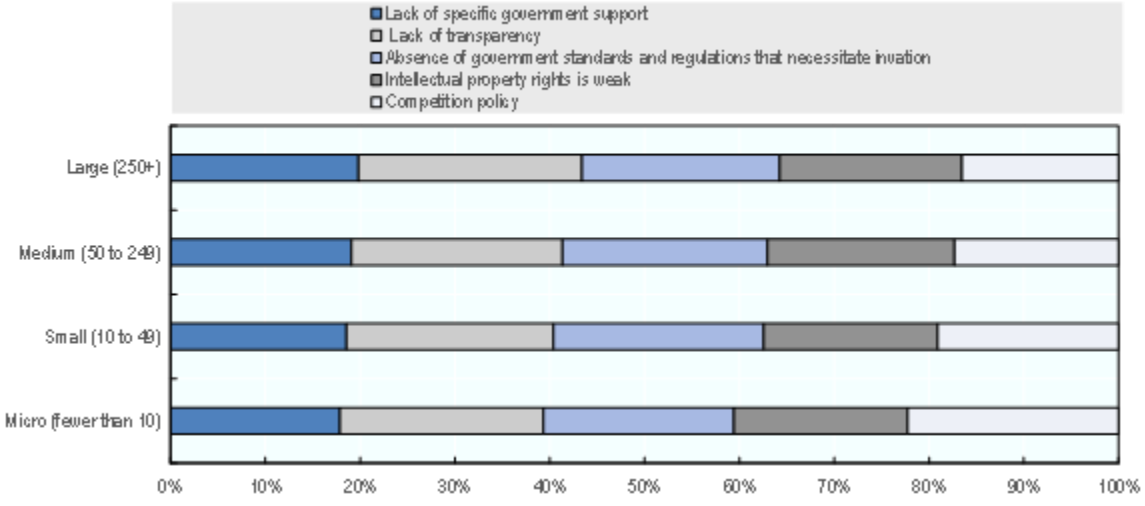
Companies which do not innovate report several reasons for not doing so, such as the lack of specific government support, the absence of government standards and regulations that necessitate innovation, lack of transparency, insufficient intellectual property protection, and competition policy (Figure 5.6). Interestingly, small companies seem to be more concerned about competition policy than large ones.

Overall, innovation activity in the business sector seems to be quite dynamic in Kuwait, with a significant proportion of innovating businesses, especially the medium and large ones. In the smaller companies, cost and knowledge factors are hampering innovation, and clearly there is very little support for innovation, since only 3% of innovating companies receive any kind of support for this activity.

Figure 5.5. Product innovation typology in Kuwait, per sector

Note: The left-hand graph describes product innovation typology in industrial sectors, while the right-hand graph describes service sectors.
Source: Kuwait Innovation Survey 2018/19.

Figure 5.6. Reasons not to invest in innovation, Kuwait



Source: Kuwait Innovation Survey 2018/19.

5.5. Research and development in enterprises

Research and development is less widespread than innovation, and only 17.6% of all enterprises report at least one R&D employee; this percentage varies from less than 8% for micro enterprises to nearly 36% for large enterprises (Table 5.2). On average, those companies that do have R&D employees have 5.8 R&D employees, ranging from less than 3 in micro enterprises to about 10 in large companies. Average spending on R&D per company is about KWD 46 000 (USD 150 000), ranging from KWD 4 400 (USD 15 000) in micro to KWD 115 500 (USD 380 000) in large companies.

Table 5.2. R&D in businesses, Kuwait

	Total enterprises	Number of enterprises with at least one R&D employee	Share of enterprises with at least one R&D employee	Average number of R&D employees (enterprises with at least one)	Average annual intramural spend, KWD[(1)]
Micro (0-9)	335	26	7.8%	2.8	4 400
Small (10-49)	1 149	151	13.1%	3.9	13 800
Medium (50-249)	611	149	24.4%	5.9	58 800
Large (>250)	229	82	35.8%	10.1	115 500
Total	2 324	408	17.6%	5.8	46 200

[(1)]Average spend is calculated by taking the average of the companies that report non-zero expenditure.
Source: Kuwait Innovation and R&D Survey.

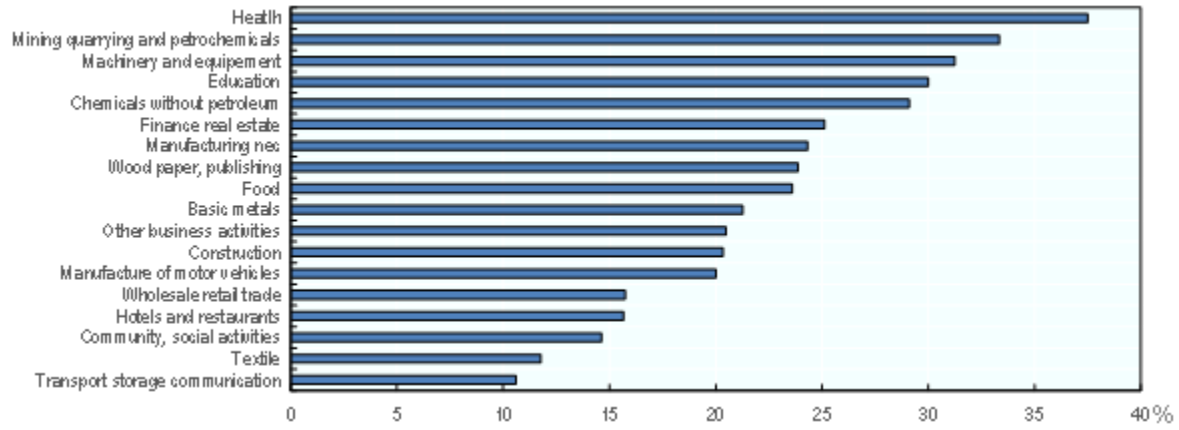
Large disparities are found according to sector (Figure 5.7). The sectors with the most R&D activity are health, followed by mining, quarrying and petrochemicals, machinery and equipment, education, and chemicals.

Even the large oil companies are still in the process of establishing R&D units capable of creating original research. Kuwait Petroleum Corporation is aiming to set up a fully-fledged R&D centre by 2023 (Box 5.12). The projected R&D centre with 400 staff would largely exceed all other R&D set-ups in Kuwaiti commercial entities.

The role of intellectual property is marginal. Only 15 companies (less than 1% of the total) reported a patent application.

A series of interviews and a focus group with Kuwaiti companies enabled us to better understand the R&D activity within companies. Many of the companies performing R&D are multinationals, and their Kuwaiti operations usually perform R&D which adapts the product or service to local standards and legislation. More elaborate R&D involving new product development is not commonly carried out in Kuwait. This is due to a combination of factors, including lack of skilled personnel (especially in the IT field), as well as risk aversion in the market itself: Kuwaiti regulators and consumers tend to prefer products which have been tested and proven in other markets before adopting them in Kuwait.

Figure 5.7. R&D in businesses, per sector, Kuwait



Note: Enterprises declaring intramural expenditure, at least one R&D staff or practicing R&D continuously.
Source: Kuwait Innovation and R&D Survey.

5.5.1. State-owned enterprises as contributors to innovation policy

In some countries, SOEs are used as motors for development and the creation of R&D capacity, for example via procurement and their participation in national development projects in key industries. They, however, generally suffer from a lack of innovation culture and capabilities and require specific actions to engage them in R&D activities. Malaysia is an interesting example of a country which strives to make its SOEs more innovative through dedicated communication and review of their capabilities (Box 5.13).

Box 5.13. Fostering innovation in state-owned enterprises

The role of state-owned enterprises (SOEs) in innovation has been studied mainly in Asian economies due to their expected, and sometimes effective, contribution to national economic development.

Several examples exist where SOEs have performed important roles either as innovative actors and/or innovation policy instruments. As innovative actors, they perform research and innovation activities like any other company, however sometimes with a longer strategic horizon and some more pronounced consideration for public goods due to their ownership structure. In the second role, specific linkages to SOEs allow the government to use them as drivers of innovation and, more generally, change agents. Governments can, for instance, directly fund and strategically steer large-scale R&D projects within these SOEs. They can leverage some of the specific features of SOEs, i.e. the capacity to perform R&D with longer time horizons, use procurement for innovation and other demand-based measures, and foster and nurture collaborative innovation and production networks. It was the case of Petrobras in Brazil which, benefiting from strong autonomy, somewhat took on the roles of ministry, regulator and innovation-oriented developmental agency. Since the 1980s, the company has gradually been creating its own domestic supplier networks of universities and other companies to develop new skills and technological solutions for the needs of the company The state authorities can also provide proactive customisation of educational, regulatory and procurement policies to support these SOE strategies and projects.

However, these two roles of SOEs in innovation activities should not be taken for granted. In several countries, governments keep using these companies as “cash cows”, notably in the oil sector. As argued by Tõnurist and Karo (2016), it also calls for high levels of policy co-ordination on the side of the government and the avoidance of short-termism.

In Malaysia (where they are named “government-linked companies”), despite a major privatisation programme launched in the early 1990s, SOEs still occupy a key position in the national economy, including in telecommunications, power generation and supply, ports, airports, highways, post, telecommunications, railways, and sewerage. The Malaysian government used SOEs to leverage its intervention in a wide range of priority industries (food, chemicals, iron, steel, petroleum transport, wood products, etc.), especially during the 1980s. For instance, PETRONAS, the national oil and gas company, financially supported several government mega-projects outside its core business, such as urban development, as well as industry and service endeavours such as the foundation of Proton, the national carmaker, which became one of the main domestic R&D performers. Proton employed 600 research engineers in its R&D centre in 2015.

However, as in several other Asian countries, the contribution of SOEs has been limited, beside special cases such as Proton, to some links with higher education institutions and to some initiatives in the financial (new Islamic financing products and services) and sustainable development areas (biomass projects). The government has therefore tried to foster innovation activities in SOEs, starting with an assessment of the largest Malaysian government-linked companies’ innovation capabilities undertaken in 2011. Beside the assessment dimension, this initiative was also a way for the government to promote the innovation mind-set and culture across Malaysian companies. The results of this survey showed that while coming close to best-practice level on certain dimensions, Malaysian government-linked companies were lagging behind the global benchmark on key innovation dimensions, such as the “importance of innovation” and “innovation as an integral part of business strategy”.

Sources: OECD Innovation Policy Review Malaysia (OECD, 2016a), Tõnurist, P. and E. Karo (2016), “State owned enterprises as instruments of innovation policy”, https://doi.org/10.1111/apce.12126.

In Kuwait, the state's major industrial holdings are in the KPC and its subsidiaries. These have significant R&D activities, but currently, most oil research is performed in KISR under the umbrella of a memorandum of understanding with the KPC. The bulk of the staff in the R&D department are managers, managing the linkages with KISR and other external (foreign) research partners (including the Q8 Research & Technology Centre, the KPC's research subsidiary located in the Netherlands). The R&T Department[10] remains confined to testing new technologies acquired externally. The KPC has prepared an ambitious plan for the creation of an International Petroleum Research Centre. However, this plan has already been significantly downsized (the budget has been reduced from KWD 500 million to KWD 100 million, with a significant portion reserved for the building) and is yet to be realised.

Kuwait also has a small number of state-owned companies outside the oil sector, for instance the Kuwait Flour Mill and Bakeries Company (under the Ministry of Commerce and Industry), as well as utilities and public transport companies. These may have some opportunities to increase absorptive capacity and innovation, providing exemplars for other companies.

5.6. Academia-business co-operation and linkages

Among the innovating companies, about 14% have co-operated with an external partner, most often a partner located in Kuwait, and the partner is (in decreasing order of frequency): an enterprise within the enterprise group, a supplier, a client from the private sector, a client from the public sector, a consultant, a competitor, an academic partner from university, or an academic from a public research institute. As far as foreign partners are concerned, they are most often suppliers from Europe or the People's Republic of China, an enterprise group enterprise in Europe or the GCC, or a client partner from the GCC. The most valued partners are suppliers (35%), enterprises from the same group (31%) and private sector clients (14%), followed by consultants (8%) and very rarely academic partners (4%). Collaboration with universities is very rare. Practitioners and observers cite the main reason as a lack of requisite expertise at Kuwaiti research institutes and universities.

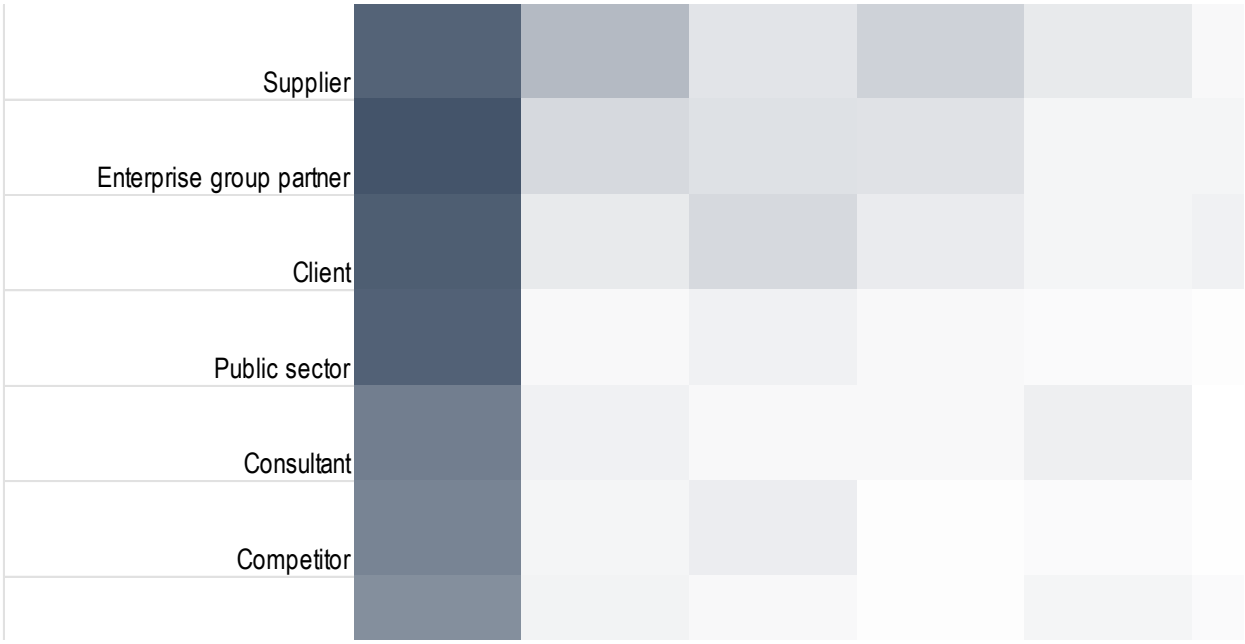
Collaboration on innovation activities as such is much lower, and only 140 (13.8% of the innovating companies) enterprises have actually co-operated on innovation activities. This percentage varies from 4% for micro companies, 9% for small companies, 18% for medium-sized ones and 22% for large companies. At the sector level, the highest propensity to co-operate is in food (24%) followed by education (22%), transport and storage (21%), finance and real estate (19%), and chemicals (18%).

Co-operation predominantly occurs within national borders (58% of all occurrences). International co-operation is fragmented, occurring preferentially with Europe, followed by GCC neighbours, Asia, and then the United States.

Co-operation also occurs along the full spectrum of potential partners, with an emphasis on co-operation with suppliers, enterprise group partners and clients, and the public sector. Co-operation with academia also occurs, but is more international in nature. Some international co-operation also occurs with enterprise group partners (Figure 5.8).

When asked about the most valuable type of co-operation, companies put forward co-operation with companies within the same group, and with suppliers, followed by co-operation with clients, the public sector and consultants.

Figure 5.8. Innovation co-operation by partner and location



Note: Darker colour indicates more companies reported co-operation (scale to the right). Multiple answers were possible by the same respondent. GvPPRI stands for government, public or private research institutes, while HEI stands for universities or other higher education institutions. GCC: Gulf Cooperation Council.
Source: KCSB Innovation Survey.

5.7. Policies in favour of business innovation

The objective of the Kuwaiti government is to boost the private sector and enhance entrepreneurship; in particular, to boost employment of Kuwaiti nationals in the private sector. It is also trying to stem the rapid increase of the wage bill in the government sector.

5.7.1. Entrepreneurship policy – the National Fund for SME Development

Kuwait has a legacy of SME support, starting in 1996 with the Kuwait Small Projects Development Company (KSPDC) set up by the Kuwait Investment Authority, with a fund of KWD 100 million for SME support. It provided loans with very high default rates of borrowers. By 2008, it switched to equity financing, for projects up to KWD 500 000. However, there were difficulties in identifying good projects to invest in. In addition, the overall impact was seen as contributing to job creation mostly for non-Kuwaitis, an outcome not deemed desirable. Indeed, by 2003, 819 jobs had been created, 761 of which were held by non-Kuwaitis (Ezell and Atkinson, 2011).

In 2013, the National Fund for SMEs was set up as the main policy vehicle to achieve that objective. It has been launched with a much larger scale than the KSPDC (capital of KWD 2 billion), with a clear focus on Kuwaiti employment (Box 5.9).

The National Fund is conceived as a “one-stop shop” for entrepreneurs, who should be able to get both finance and training to create successful ventures. The National Fund experienced some operational issues in its first years of operations and few loans were disbursed.

Overall, the initial design of the National Fund loans with a high projected default rate and no upside for the fund would suggest that entrepreneurial job creation would come at a very high projected cost to the government, which could be comparable to providing a government job.

Some of the regulations of the National Fund are difficult to accept for technology start-up firms with high-growth potential:

- The ban on equity ownership by non-Kuwaitis in companies sponsored by the National Fund. In the technology start-up sector, talented human capital can only be attracted through equity participation. Since very often such talents need to be attracted from outside, National Fund financing is seen as inappropriate.
- No second-round financing for successful entrepreneurs who wish to grow their enterprise is foreseen.
- An entrepreneur who fails once will not be supported again – there is no "second chance".
- Legal liability for entrepreneurs who cannot pay back.
- Lack of transparency in the selection process was reported by several entrepreneurs.

In addition, most technology entrepreneurs in Kuwait are non-Kuwaiti themselves, and therefore not eligible for National Fund financing. Such entrepreneurs can only count on very rare private funds such as Faith Capital, founded by successful technology entrepreneur Mohammad Jaffar, founder of Talabat, who created a venture fund with the proceeds of the sale of Talabat. Finally, the frequent changes in the National Fund structure and rules are a factor of instability.

The 2018 Law on the National Fund foresees equity investments in SMEs. The ambition of the new management of the National Fund is for it to be more than a funder: it is to become an enabler. It will provide mentoring, help with licensing, as well as working spaces, retail outlets in state-owned "co-op" supermarkets. It remains to be seen if this attempt will be more successful than the previous experience of the KSPDC.

An announcement was made in January 2019 about the creation of a USD 200 million technology fund for technology in Arab countries (Arab Times, 2019).

5.7.2. Policy support to existing businesses

Efforts in favour of existing companies are deployed essentially in two areas:

1. Regulatory simplification efforts focused on the improvement of the framework conditions, which have resulted in the improved ranking of Kuwait in the major indices such as World Bank's Doing Business and the World Economic Forum's Global Competitiveness Index.
2. Infrastructure provision, such as the creation of new industrial zones (see Box 5.14).

The regulatory efforts have been discussed at length in Chapter 2 and the OECD acknowledges progress that has been made.

Infrastructure projects are needed, in particular because of the specific issues with the provision of land, which is highly regulated in Kuwait. Land is provided by the Public Authority for Industry under very strict criteria, and in the form of leases. Provision of land is seen as one of the hurdles to doing business, since demand exceeds supply of fully serviced land. This is why projects such as the Shadadiya industrial area (see Box 5.14) are important. An alternative solution would be to allow companies to buy land and build their own utilities, but this solution is not allowed under present Kuwaiti regulations.

Box 5.14. Shadadiya industrial area

The Public Authority for Industry launched the construction of the Shadadiya industrial area, 500 hectares of industrial land to be equipped with infrastructure and support services to address the problem of limited availability of industrial land. The land will be divided into 1 036 industrial plots for food, chemical and other industrial activities, with different areas ranging from 1 000 m² to 10 000 m². It will be equipped with three industrial waste treatment plants, one waste treatment plant as well as a wastewater treatment plant in order to reuse water for irrigation purposes.

The objective is the development of non-oil industrial exports and diversify export structure. The Public Authority for Industry also hopes to attract national and foreign capital and expertise to establish industrial development projects.

Source: New Kuwait monitoring, Supreme Council for Planning and Development.

However, existing companies have very little direct support from the government. Out of 1 008 innovative enterprises surveyed in the Innovation Survey, only 31 mentioned receiving any support. Among those, very few cited government support per se, with only nine companies mentioning support from the Public Authority for Industry, mostly as customs exemptions.

In the absence of governmental instruments, KFAS is playing a role to support business innovation within its Innovation and Enterprise Directorate (see Box 5.15). This is important work, but the scale is clearly insufficient, since only about 20 companies are concerned in total.

The Industrial Bank of Kuwait provides loans for companies, and some companies have quoted this as support to innovation. However, those loans are exclusively for the purchase of physical assets (typically equipment), and cannot be used for working capital (see Box 5.10).

Box 5.15. The Kuwait Foundation for the Advancement of Sciences' Innovation and Enterprise Directorate

The Innovation and Enterprise Directorate (IED) works towards raising the private sector's awareness about the importance of innovation in business and provides incentives for R&D activities to improve products and services. It does so through three programmes:

- **Enterprise Knowledge Enhancement:** commission and disseminate macro level and sector level studies, which help understand the dynamics in the economy, and identify the barriers that hinder private sector development. Examples of studies include: i) the innovation landscape in Kuwait; ii) identifying priority sectors in Kuwait; cluster of innovation framework; development of the Kuwaiti private sector's S&T capabilities; SMEs in Kuwait: their impact and the way forward; assessment of private investment behaviour in Kuwait, iii) prospects of Fintech in Kuwait; iv) access to finance for SMEs.
- Enterprise Learning & Human Development: provide learning opportunities for human capital development on topics related to innovation, leadership, and new technologies through extensive training programmes for over 2 500 people annually (of which about 10% are trained abroad). The attendance fee is subsidised by KFAS but priority is given to companies that

annually contribute to KFAS budget. Macro-level and sector-level studies, which help understand the dynamics in the economy, and identify the barriers that hinder private sector development. Examples of studies include: the innovation landscape in Kuwait; priority sectors; prospects of Fintech in Kuwait; access to finance for small and medium-sized enterprises.

- **Enterprise Technological Development:** support and incentivize R&D in Kuwaiti companies by providing grants and exposure to international knowledge providers. KFAS provides a scheme for co-funding grants to incentivize 1) new idea feasibility; 2) implementation of R&D projects. In many cases the program gives informal technical advice and/or act as broker for knowledge providers locally and internationally. The program support an average of 10 projects per year (mostly feasibility studies), for an annual amount of USD 0.7-0.8 million (Figure 5.9).

One notable example of a possible role for this program is enabling R&D co-operation in the supply chain. An example of such efforts was the co-operation facilitated by the program among Kuwait Food Company known as "Americana", EQUATE Petrochemicals (a Kuwaiti polypropylene producer), and one of Fraunhofer Institutes as knowledge provider to enable EQUATE to develop and produce food wrapping material that meets Americana's desire to have smart food wrapping (capability to visually indicate rotting of cold cut meat products).

Figure 5.9. Co-funded R&D projects in private sector companies, Kuwait

Sources: KFAS (2018[193]), 2018 Achievements Dashboard, https://www.kfas.com/media/d4d79344-8dd2-4d54-a3b0-fb5b36abed8f/9Ff76g/Documents/2018%20Achievement%20EN.pdf ;Interviews with KFAS management.

5.7.3. Policies for technology transfer and diffusion

Technology absorption from abroad is the main tool which should enable Kuwait to move away from its dependence on income from natural resources over time. It is critical for Kuwait to maintain connections with international sources of knowledge and intellectual property policy should foster foreign direct investment and global collaborative research alliances that bring new know-how.

Strong collaboration between various intermediary organisations is the hallmark of a sound innovation ecosystem, and Kuwait could benefit from strengthening these intermediaries and exploring measures to foster greater co-operation among them. Most significantly, most of these entities do not seem demand-driven, and observers in general point to cumbersome procedures in these organisations that stifle innovation. Hence, the creation of a robust pipeline of inventions and strengthening linkages between the intermediaries should be a key priority for the government.

Currently, intellectual property creation and monetisation is supported by the Sabah Al-Ahmad Centre for Giftedness and Creativity (see Box 5.16), which provides monetary and non-monetary support for patenting and commercialisation. Intellectual property (IP) protection and monetisation efforts at other institutions such as KISR, KU, etc. are nascent, though their attempts to create IP programmes are a step in the right direction (see Box 5.17).

Box 5.16. Sabah Al-Ahmad Centre for Giftedness and Creativity

The Sabah Al-Ahmad Centre for Giftedness and Creativity (SAC) was established in 2010 and has made progress towards achieving its objective of building a safe haven for gifted and creative Kuwaitis by investing in their innovations and ensuring Kuwait's development on a global level. The SAC has been encouraging gifted students and youth by providing programmes which are tailored to nurture their creative potential and to provide them with opportunities in the domains of creativity and giftedness.

SAC has a mini Fablabs for prototyping and four Fablabs around the country which host entrepreneurs. The Fablabs facilities and machinery are in accordance with international standards, having been equipped with 3D printers, a laser cutter, a vinyl cutter and a Computer numerical control (CNC) milling machine, providing the resources and tools needed for investors to develop their prototypes. The use of the services provided in these Fablabs are free of charge, except for big firms, which must pay a fee. The prototyping lab has two engineers and three technicians. It also provides training and help with marketing research. To date, only two Fablabs are operational, the rest have been closed down.

SAC also supports entrepreneurs in their patenting activities, by subsidizing patent drafting services and submission to USPTO. In some cases, SAC also assists with prototyping and certification of the products.

In 2019 SAC reports:

- 7 inventions with commercialization potential
- 31 registered patents
- 4 inventions received marketing support by NF
- 24 developed prototypes in collaboration with various international firms.

Source: Interviews with SAC management.

Box 5.17. Technology transfer offices in Kuwait

Kuwait Institute for Scientific Research (KISR)

KISR established its technology transfer office (TTO) in 2017, but there is no dedicated budget. Thus far, the TTO has not commenced operations. While a skeletal staff of two was created, the TTO experiences high turnover because the staff is considered as a support unit, which is not as attractive for staff as a research unit, and does not count towards a promotion. Hence the unit only attracts fresh graduates without experience. There is no staff with business experience. Further hiring policies make it very difficult to hire expatriates because of the Kuwaitisation rules.

Kuwait University (KU)

The intellectual property (IP) office at Kuwait University has two divisions: one is research services that deals with contract research, the other is a TTO. The former includes two departments: one dealing with memoranda of understanding and the other with workshops, etc. The Vice President for Research signs all external contracts (memoranda of understanding, etc.). The Kuwait University bylaw drafted in 2005 governing the ownership and commercialisation of inventions arising out of university research was only recently (in late 2017) operationalised through the creation of the "patent office" (TTO). This intellectual property office was created in 2005. Until 2016, the role of the IP office was to register patents through a lawyer in the United States. Commercialisation was not its mandate. Kuwait University has its own bylaws because it is an independent entity, and hence, unlike KISR does not suffer from the same constraints to operationalise a well-functioning TTO.

Source: Interviews with KISR and KU management.

Technology transfer has been partly achieved in the oil sector where collaboration with BP, Shell, JPPC, Halliburton, Schlumberger, Baker Hughes and other international suppliers has brought foreign technology to Kuwait. However, this has mostly occurred through adoption of existing technology with minimal adaptation, and insufficient build-up of human capital in Kuwait (see Box 5.12).

Beyond the oil sector, some efforts have been made in this sense by NTEC (see Box 5.18), which was originally set up with the objective of investing in foreign technology firms and creating spill-overs in Kuwait. Through scouting local and regional markets, NTEC identifies market needs and potential business opportunities in both the private and the government sectors, then reacts via its various business models and the capabilities of its fully owned subsidiaries, to address such needs and opportunities in a manner that suffices its main objective to absorb technology into the Kuwaiti ecosystem.

NTEC experienced a challenging period following the resignation of its board in 2008 caused by the decision to reduce the paid-up capital by half. This caused a considerable slowdown in the period 2008-12. Since then, NTEC's capital has been increased again; however, the loss of institutional memory and disruption inevitably caused a slowdown.

Additional hurdles faced by NTEC include:

- public procurement rules which rely on the lowest cost to win the tender, making it difficult for innovative solutions to be adopted;
- profitability is a more important objective than technology transfer;
- interference of auditors in investment decisions (force exit when the stock market falls);

- Kuwaitisation rules –NTEC's initiatives to bring in foreign technology can be overturned by auditors (or parliament) who ask for a tender to give an opportunity to Kuwaiti companies to compete, even when there is clearly no domestic supplier of the technology.

Box 5.18. The National Technology Enterprises Company

The National Technology Enterprises Company (NTEC) was established in November 2002, gaining full support by the Kuwait Council of Ministers, and has been operational since late 2004 as a fully owned subsidiary of the Kuwaiti Investment Authority (KIA). Capitalised at KWD 100 million (USD 330 million), with a paid-up capital of KWD 85 million, NTEC was created to play a vital role in servicing major stakeholders in Kuwait with their technology needs.

The company holds a unique position, being fully owned by the Kuwaiti government, yet enjoys all private sector privileges and operates as such, with its own business license, articles of association, board of directors and capital. NTEC's business model was intended to be demand-driven and its investment strategies are aimed to address its core mandate: technology and knowledge transfer.[1]

NTEC's sector foci are: information and communications technologies, life sciences and healthcare technologies, energy, renewable energy, and water and environmental technologies.

NTEC has three core activities:

- NTEC's subsidiaries invest in the project's equity in partnership with the private sector and accommodate two types of technology projects: internally developed by NTEC's subsidiaries and externally developed by the private sector. In both cases, NTEC's subsidiaries favour a form of joint venture with technology providers, thus developing or scaling or customising (to Kuwaiti context) solutions with added value.
- International venture capital investments are NTEC's subsidiaries' core activities. The focus is pre-commercialisation stage companies that are viable and financially attractive with clear exit strategies and a vision to expand into new markets in Kuwait and the region. NTEC's subsidiaries invest in companies with products or services which solve existing customer problems with ground-breaking technologies and have the potential for above-average, substantial growth. Through many years of experience in venture capital investments, NTEC's subsidiaries' team has attempted to develop a systematic process based on a thorough selection process, comprehensive due diligence and active investment management. However, there is considerable bias towards more mature technologies and risk aversion leading to anaemic investments in truly early-stage technologies.
- To reduce the time gap of certain demanded technology introduction into mass markets along with building a true technology transfer platform, NTEC's subsidiaries invest in the form of private equity in technology companies (see Box 5.7) that have the potential for regional expansion, and a proven concept with a sustainable business model.

Since its inception, NTEC has expanded considerably, and its five subsidiaries are focused on different themes:

- National Advisory Services Company (NASCO), which focuses on providing best-in-class technology, strategy and management advisory services to both public and private sector institutions. NASCO also has a technology transfer office which operates in two ways: 1) scans research institutions in Kuwait for promising technologies. At Kuwait University and the Kuwait Institute for Scientific Research, it has identified 6-10 medical doctors who are really innovative, and 20 patents with good potential; 2) identifies foreign companies that want to do business in

Kuwait and explores whether their technological solutions have demand in Kuwait. For instance, it is working with Redwave energy (United States) that captures low-temperature waste heat (<200°) and converts it to energy and is in the process of setting up a pilot plant.

- EnerTech tackles technology projects and investment, with a special focus on the transfer of technologies from around the world to Kuwait and Gulf Cooperation Council countries.
- Kuwait Life Science Company (KLSC) operates similarly to EnerTech, but focuses on healthcare innovative concepts, seeking to provide access to emerging technologies from around the world to the public and private sectors in Kuwait. Established in 2010, the KLSC has a paid-up capital of KWD 15 million (~USD 53 million). It is fully owned by the National Technology Enterprises Company. Having a clear unmet need for healthcare innovative concepts and demanded services in the Middle East and North Africa region, the KLSC has been designed as an integrated healthcare company building unique projects, and is considered one of the pioneer venture capitalist and private equity companies in the Middle East that invests globally and operates regionally seeking to advance healthcare services and systems within the region. The KLSC supports both public and private sector stakeholders to access emerging technologies, establish unique projects and adapt best practices prevailing in today's healthcare field. It operates in healthcare investment, life sciences training, medical technology and pharmaceutical distribution.
- Impulse was established by the National Technology Enterprises Company (NTEC) in 2012 to take over the direct investment activities of NTEC in the Information and Communication Technology (ICT) field. Impulse is a unique venture capital company that transfers technology into the region through its investments. Impulse invests in high potential companies that are fully developed or at the forefront of developing, utilizing its investment tools such as Private Equity, Venture Capital and Direct Investment to lead both government and private sectors in the development and application of leading edge technology. Impulse has a robust and clear perspective on emerging technologies, combined with its deep understanding of the market changes which made it a valued ICT services provider for operators, governments and start-ups.
- Global Innovation Company for Software Development & Training W.L.L. (GIC) is one of the innovative human capital development solution providers. It is a fully owned subsidiary of National Technology Enterprises Company – NTEC - a mandate by the Kuwait Council of Ministers for technology & knowledge transfer, as a fully owned subsidiary of Kuwait Investment Authority - KIA. The company is committed to evolve regional HR practices and knowledgebase through simplifying and localizing leading global HR processes and practices, enable innovation and HR knowledge transfer through connecting HR practitioners, equip HR practitioners with the latest, most relevant and practical HR knowledgebase & skill set, educate HR as a core function of every manager. GIC focuses on building milestone strategies and goals with clients, accommodating International diversified solutions/services, skills and knowledge; and learning solutions covering areas of specialized technical training in Soft Skills, Human Resource, Project Management and Management Information Systems, innovative knowledge transfer techniques through our services and programs.

Source: Interviews with NTEC management, www.ntec.com.kw/#about.

The 2007 Blue Ribbon report called for NTEC to engage more deeply with KISR. NTEC did attempt to generate a more robust pipeline from KISR; however, these attempts had limited success due to numerous challenges at KISR including, but not limited to, restrictions of non-KISR researchers to access KISR's

resources, KISR's IP policies, impossibility to make secondment arrangements for KISR researchers with guaranteed return to KISR, etc. Deeper engagement between the two entities was called for in the Blue Ribbon report, but such deeper engagement has yet to materialise. There have been indications that NTEC has started collaborating with the SAC helping to scale up the SAC's inventions, but the OECD has been unable to get confirmation of this collaboration.

Attracting foreign investment with the objective of technology spill-over is also within the mandate of the Kuwait Development and Investment Promotion Agency. One result of these efforts is the establishment of the GE Knowledge Technology Centre (see Box 5.19).

Box 5.19. General Electric Knowledge Technology Centre

In 2017, General Electric (GE) established a Knowledge Technology Centre as part of GE Power Services. Through its collaboration with the Ministry of Electricity and Water, GE Power services today powers 37% of Kuwait's electricity by supplying its advanced gas turbines to six different power plants across the country. The centre, which counts 25 staff, has 3 main activities:

- training (in relation to GE technology, customers or internal GE employees): 900 people are trained each year;
- a tooling centre;
- an engineering centre (engineering, research innovation) which serves two goals: providing service for testing and R&D.

The centre has attempted to enter into a memorandum of understanding with Kuwait University and the Kuwait Institute of Scientific Research, but to date there has been no substantial collaboration. Certain students have been financed by the SME National Fund to obtain training from the centre. Overall, the centre, though a laudable initiative, appears to have very feeble links with the overall innovation ecosystem of Kuwait.

Sources: Interviews with General Electric Kuwait; General Electric (n.d.), GE in Kuwait, https://www.ge.com/menat/company/kuwait.

However, interviews with international technology companies revealed relatively limited appeal of Kuwait as a destination for the establishment of R&D facilities. Investments in Kuwait mostly concern sales and aftersales, as well as training facilities. The main barriers to R&D in Kuwait were quoted as:

- lack of qualified workforce for R&D locally, high labour costs and barriers to hiring expatriates;
- conservative culture – Kuwaiti legislators and consumers alike do not want to test innovations; rather, they prefer adopting products which have been proven and tested elsewhere;
- small size of the Kuwaiti market, and remaining barriers to do business within the GCC region, which does not function as a single market.

Intellectual property policies

Strong intellectual property protection positively influences a firm's propensity to invest in innovation (Allred and Park, 2007).

In the case of Kuwait, IP priorities could underpin the government's efforts in economic diversification and building technology-based entrepreneurship, human capital and digital skills. For instance, the WIPO

Performances and Phonograms Treaty (WPPT) and the WIPO Copyright Treaty (WCT)[11] set up a comprehensive copyright and related rights management and enforcement model system for the digital age, and encourages digital entrepreneurship that relies on creative content. Similarly, strong trade secrets legislation provides a trustful environment to invest and provide knowledge spill overs.

On the other hand, providing for safe harbours and patent exemptions for experimentation purposes might lead to attracting R&D spill overs and R&D centres in biotechnology and medical sciences. Such measures have been successful in many countries, such as in the United Kingdom. Moreover, the possibility of creating IP assets in emerging technologies of the Fourth Industrial Revolution (such as artificial intelligence, blockchain, 3D printing, the Internet of Things, augmented and virtual reality, Internet of Energy) should be explored.

Kuwait is a member of the World Intellectual Property Organization (WIPO) and the World Trade Organization (WTO), and also signatory of the WTO TRIPS Agreement, the Arab Convention for the Protection of Authors Rights, the Berne Convention for Protection of Literary and Arbitrary Works, and the TRIPS Agreement. According to the World Economic Forum's *Global Competitiveness Report 2019* (Schwab, 2019), Kuwait was ranked 71st out of 141 countries in terms of intellectual property protection, up from 80th in 2017/18, but still far behind the United Arab Emirates, ranked 19th, Qatar 23rd and Saudi Arabia 27th.

In May 2016, Kuwait's National Assembly passed the new Copyright and Related Rights Law. This law will help Kuwait accede to the WPPT. Kuwait has not acceded to either the WPPT or the WCT; however, it is in the process of drafting implementing regulations that have the opportunity to bring its regime in line with international standards and with the WPPT. The development of the creative industry in Kuwait will also benefit from strengthened copyright protection.

Patent protection in Kuwait used to work exclusively via the GCC Patent Office. Kuwait is one of the six member countries of the GCC, a regional organisation which also includes Bahrain, Oman, Qatar, Saudi Arabia and the United Arab Emirates. In April 2016, the Kuwaiti Ministry of Commerce and Industry started regulating patent protection in Kuwait via Law 115/2016, implementing the previously issued Patent Law (No. 71/2013) to approve and implement the regional GCC Patent Law declared in 1999. Since then, the Kuwait Patent Office stopped accepting applications, and instructed interested parties to seek protection through the GCC Patent Office in Riyadh, Saudi Arabia. However, in 2017, Kuwait reinstituted the national IP office for examining patents.

Kuwait joined the WIPO Patent Cooperation Treaty (PCT) in 2016, as the 149th member and the 6th and final GCC member state to accede to the PCT.

Nevertheless, few inventors choose the domestic patent followed by the PCT procedure, the overwhelming majority applies to the United States Patent and Trademark Office (USPTO), and a minority goes to the European Patent Office and the Japan Patent Office (JPO). One reason for this is the perceived prestige of having obtained a US patent, despite having meagre prospects for technology commercialisation and product/service placement in the United States.

Patents originated in Kuwait granted by the USPTO for the period of 2005-16 show that the highest number of patents issued by the USPTO is in the field of medical technology, followed by furniture, games, transport and civil engineering.

However, there is increased realisation that merely obtaining a patent is no guarantee of the commercial success of an invention and the SAC, which supports patenting efforts in the country, has created more rigorous standards for applicants to obtain support for their patenting endeavours.

The overall IP regime in Kuwait suffers from the lack of trained IP professionals skilled in IP management, valuation and monetisation. This could be improved by organising IP and technology transfer trainings and programmes that target these stakeholders specifically.

Kuwait does not have a separate statute that regulates the trade secrets law exclusively. Firms therefore use robust and strong contractual provisions as a strategy for protecting trade secrets. This is especially true of foreign firms wanting to protect their IP in Kuwait. However, the recent “Kuwaitisation” movement has made authorities reluctant to enforce strong IP provisions and contracts that protect the trade secrets of foreign firms. This has led to the inability to use robust contractual provisions (which was hitherto the practice) for IP protection. While hard data are unavailable, observers believe that this could impact knowledge transfer to Kuwait, as foreign firms may balk at sharing vital technologies if they have few mechanisms to protect IP. A strong trade secrets law could be instrumental in better IP protection and monetisation, as a lot of IP (especially process-related and business practice related) is not typically protected through patents or copyrights.

Kuwait took steps to strengthen its intellectual property laws by implementing the GCC-wide Trademark Law in December 2015. Trademark applications can be filed at the Kuwaiti Trademark Office, organised under the Ministry of Commerce and Industry.

Formulating an adequate national IP strategy and legal and regulatory framework is dependent on the technological growth trajectory of Kuwait and will underpin the projected diversification efforts. Public policies in the field of IP will need to be complemented with adequate policies in the field of technology law, labour law, higher education law, access to research results, data and instruments, awareness raising, training, and creating links between PRIs, HEIs and firms.

In addition to legislative reform for building an adequate IP system, other government policy instruments can be deployed as well, such as “codes of practice” or general guidelines on IP ownership and management. The Kuwaiti government attempted to adopt a new decree (No. 29 of 2016) for the establishment of the Kuwaiti Association for the Support of Inventors in order to provide support for Kuwaiti inventors to enable them to excel and develop more inventions and to increase the volume of Kuwaiti inventors within the innovation sector.

References

Abukumail, A., N. Karam and G. Al-Otaibi (2016), "Building Kuwait's future, one small enterprise at a time", *MENA Knowledge and Learning Quick Notes Series*, No. 153, World Bank, https://openknowledge.worldbank.org/bitstream/handle/10986/23945/Earnings0growt0dle0income0countries.pdf?sequence=1&isAllowed=y (accessed on 7 November 2019).

Al-Alawi, A. and F. Al-Ali (2015), "Factors affecting e-commerce adoption in SMEs in the GCC: An empirical study of Kuwait", *Research Journal of Information Technology*, Vol. 7/1, pp. 1-21, http://dx.doi.org/10.3923/rjit.2015.1.21.

Allred, B. and W. Park (2007), "The influence of patent protection on firm innovation investment in manufacturing industries", *Journal of International Management*, Vol. 13/2, pp. 91-109, http://dx.doi.org/10.1016/j.intman.2007.02.001.

Arab Times (2019), "Kuwait announces $200mn tech fund - Embrace digital economy", *Arab Times*, http://www.arabtimesonline.com/news/kuwait-announces-200mn-tech-fund-embrace-digital-economy (accessed on 30 March 2019).

Bardi, U. (2019), *Peak Oil, 20 Years Later: Failed Prediction or Useful Insight?*, Elsevier Ltd, http://dx.doi.org/10.1016/j.erss.2018.09.022.

Berkeley Research Group (2017), *Cluster of Innovation Framework Study: Kuwait*.

Dale, S. and B. Fattouh (2018), "Peak oil demand and long-run oil prices", *Energy Insight*, No. 25, The Oxford Institute for Energy Studies, https://www.oxfordenergy.org/publications/peak-oil-demand-long-run-oil-prices/?v=11aedd0e4327 (accessed on 7 November 2019).

Ezell, S. and R. Atkinson (2011), *International Benchmarking of Countries' Policies and Programs Supporting SME Manufacturers*, The Information Technology & Innovation Foundation, https://www.itif.org/files/2011-sme-manufacturing-tech-programss-new.pdf (accessed on 12 December 2019).

General Electric (n.d.), *GE in Kuwait*, General Electric, https://www.ge.com/menat/company/kuwait (accessed on 20 December 2019).

Guellec, D. and B. Van Pottelsberghe de la Potterie (2004), "From R&D to productivity growth: Do the institutional settings and the source of funds of R&D matter?", *Oxford Bulletin of Economics and Statistics*, Vol. 66/3, pp. 353-378, http://dx.doi.org/10.1111/j.1468-0084.2004.00083.x.

Hamid, T. (2019), *How Did Kuwait Produce Some of the Middle East's Largest Exits?*, Wamda, https://www.wamda.com/2019/02/kuwait-produce-middle-east-largest-exits (accessed on 30 March 2019).

Hutschenreiter, G., J. Weber and C. Rammer (2019), "Innovation support in the enterprise sector: Industry and SMEs", *OECD Science, Technology and Industry Policy Papers*, No. 82, OECD Publishing, Paris, https://doi.org/10.1787/4ffb2cbc-en (accessed on 8 November 2019).

KFAS (2018), *2018 Achievements Dashboard*, Kuwait Foundation for the Advancement of Sciences, Kuwait City, https://www.kfas.com/media/d4d79344-8dd2-4d54-a3b0-fb5b36abed8f/9Ff76g/Documents/2018%20Achievement%20EN.pdf (accessed on 18 November 2019).

KU Leuven (2013), *The Importance of Technology Transfer*, AUTM Better World Project, https://autm.net/about-tech-transfer/better-world-project/bwp-stories/tenofovir-disoproxil-fumarate (accessed on 13 December 2019).

KCSB (n.d.), *Annual Survey of Establishments*, Kuwait Central Statistical Bureau, https://www.csb.gov.kw/Pages/Statistics.aspx?ID=28&ParentCatID=3.

Kuwait Oil Company (n.d.), *Upstream Centre of Excellence*, https://www.kockw.com/CoE/Main.html (accessed on 20 December 2019).

Mohammed Bin Rashid Al Maktoum Foundation and Price Waterhouse Coopers (2008), *Arab Human Capital Challenge: The Voice of CEOs*, Mohammed bin Rashid Al Maktoum Foundation and PriceWaterhouseCoopers, Dubai, https://www.pwc.com/m1/en/publications/abir/ahccenglishfeb172009.pdf (accessed on 7 November 2019).

Mohnen, P. (2018), *The Role of Research and Development in Fostering Economic Performance: A Survey of the Macro-level Literature and Policy Implications for Finland*, OECD, Paris, https://cris.maastrichtuniversity.nl/en/publications/the-role-of-research-and-development-in-fostering-economic-perfor.

National Research Council Committee for Capitalizing on Science, Technology and Innovation (2008), "Introduction", in *An Assessment of the Small Business Innovation Research Program*, National Academies Press, Washington, DC, https://www.nap.edu/read/11989/chapter/1 (accessed on 8 November 2019).

Nobel, C. (2012), *How Technology Adoption Affects Global Economies*, Harvard Business School, https://hbswk.hbs.edu/item/how-technology-adoption-affects-global-economies (accessed on 11 November 2019).

OECD (2019a), *Corporate Governance in MENA: Building a Framework for Competitiveness and Growth*, Corporate Governance, OECD Publishing, Paris, https://doi.org/10.1787/20776535.

OECD (2019b), *Strengthening SMEs and Entrepreneurship for Productivity and Inclusive Growth: OECD 2018 Ministerial Conference on SMEs*, OECD Studies on SMEs and Entrepreneurship, OECD Publishing, Paris, https://dx.doi.org/10.1787/c19b6f97-en.

OECD (2017), *The Next Production Revolution: Implications for Governments and Business*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264271036-en.

OECD (2016), *OECD Reviews of Innovation Policy: Malaysia 2016*, OECD Reviews of Innovation Policy, OECD Publishing, Paris, https://doi.org/10.1787/9789264255340-en.

OECD (2015a), *Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development*, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris, https://doi.org/10.1787/9789264239012-en.

OECD (2015b), *The Innovation Imperative: Contributing to Productivity, Growth and Well-Being*, OECD Publishing, Paris, https://doi.org/10.1787/9789264239814-en.

OECD/Eurostat (2005), *Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data, 3rd Edition*, The Measurement of Scientific and Technological Activities, OECD Publishing, Paris, https://doi.org/10.1787/9789264013100-en.

OECD/IDRC (2013), *New Entrepreneurs and High Performance Enterprises in the Middle East and North Africa*, Competitiveness and Private Sector Development, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264179196-en.

OECD/World Bank (n.d.), *Technology Transfer and Commercialisation*, Innovation Policy Platform, https://www.innovationpolicyplatform.org/www.innovationpolicyplatform.org/content/technology-transfer-and-commercialisation/index.html (accessed on 12 December 2019).

Pacheco, F. (2019), *Kuwait Wins MSCI Upgrade to Emerging Market Starting in 2020*, https://www.bloomberg.com/news/articles/2019-06-25/kuwait-wins-msci-upgrade-to-emerging-market-starting-next-year.

Ramadhan, M., M. Girgis and S. Al-Fulaij (2018), *SMEs in Kuwait: Summary Report - Small and Medium Enterprises in Kuwait: Their Impact and the Way Forward*, Kuwait Institute for Scientific Research, Kuwait City, https://www.kfas.org/media/1d025bcb-e3ea-4763-8b89-3b27c32680bd/EL8atw/StudiesResearchers/Files/Small%20and%20Medium%20Enterprises%20in%20Kuwait%20-%20Report%20Vol%20I.pdf.

Sartawi, M. (2012), “State-owned enterprises in Kuwait: History and recent developments”, in *Towards New Arrangements for State Ownership in the Middle East and North Africa*, OECD Publishing, Paris, https://doi.org/10.1787/9789264169111-6-en.

Schwab, K. (ed.) (2019), *The Global Competitiveness Report 2019*, World Economic Forum, Geneva, http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf.

Shapira, P. et al. (2015), *Institutions for Technology Diffusion*, Technical Note IDB-TN-832, Inter-American Development Bank, https://publications.iadb.org/publications/english/document/Institutions-for-Technology-Diffusion.pdf (accessed on 13 December 2019).

Sternberg, R. and S. Wennekers (2005), “Determinants and effects of new business creation using Global Entrepreneurship Monitor data”, *Small Business Economics*, Vol. 24, pp. 193-203, http://dx.doi.org/10.1007/s11187-005-1974-z.

Tõnurist, P. and E. Karo (2016), “State owned enterprises as instruments of innovation policy”, *Annals of Public and Cooperative Economics*, Vol. 87/4, pp. 623-648, https://doi.org/10.1111/apce.12126.

UNDP (2011), *Support the Capacity Development of the General Secretariat of the Supreme Council for Planning and Development to Direct the Strategic Planning Priorities of the State of Kuwait*, United Nations Development Programme, https://www.kw.undp.org/content/kuwait/en/home/operations/projects/democratic_governance/support-the-capacity-development-of-the-general-secretariat-of-t.html.

Weber, K. and H. Rohracher (2012), “Legitimizing research, technology and innovation policies for transformative change: Combining insights from innovation systems and multi-level perspective in a comprehensive ’failures’ framework”, *Research Policy*, Vol. 41/6, pp. 1037-1047, http://dx.doi.org/10.1016/j.respol.2011.10.015.

Wong, P.K., Y.P. Ho and E. Autio (2005), “Entrepreneurship, Innovation and Economic Growth: Evidence from GEM data”, Small Business Economics, Vol. 24, pp.335-350, https://doi.org/10.1007/s11187-005-2000-1.

Zain (2020), Zain News, https://www.kw.zain.com/en/web/zain-kuwait-website/news1?art=1588157.

Notes

[1] In reality, significantly less than that, since the survey does not cover small enterprises with less than ten employees.

[2] Traditionally very capital-intensive sectors with little labour.

[3] Formerly Morgan Stanley Capital International.

[4] Frontier markets are seen as more developed than the group of “least developed countries”, but considered too small, risky and illiquid to be classified as emerging markets.

[5] Excluding personal household employment, for international comparability purposes.

[6] A government subsidy paid to Kuwaiti nationals accepting employment in the private sector, as compensation for the wage differential between the public and private sectors.

[7] www.ibkuwt.com/export/sites/default/web/en/attachments/annual_report/Annual_Report_2016.pdf.

[8] Please note that these companies did not participate in the survey.

[9] This is not surprising, since the sample did not include micro companies, which are the typical the target of the National Fund.

[10] R&T is distinct from R&D.

[11] The WPP and the WCT are also known as the WIPO Internet treaties.

OECD Reviews of Innovation Policy

KUWAIT

The slowdown in market demand for oil is putting increasing pressure on Kuwait's current economic and social model. This model is based on the distribution of petroleum export proceeds to Kuwaiti citizens, with relatively limited long-term investment in knowledge production and the upgrading of the national innovation capacity.

The transition towards a knowledge-based society – where value creation, the resolution of societal challenges and the well-being of society at large will be based on the production, diffusion and implementation of knowledge – is becoming an imperative. This is recognised within the national development strategy which formulates the objective of attaining 'Smart Kuwait' by 2035.

Such a transition is challenging and can only be achieved through the build-up of appropriate governance of the STI system with adequate institutions such as a Ministry and a professional agency with a mandate for research and innovation. This set-up should help raise awareness and reduce barriers to innovation, reinforce the scientific research base, develop the support for business innovation, foster knowledge diffusion and co-creation between science and industry, build up the human capital needed, and establish the role of science, technology and innovation in tackling Kuwait's societal challenges.

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