

Three Decades and Beyond Strategic Planning for Research and Development in Kuwait: The Case of Kuwait Institute for Scientific Research

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Abstract

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Strategic planning at Kuwait Institute for Scientific Research (KISR) defines the path toward investment and balanced distribution of resources to meet the Institute's mission and goals. Strategic plans are founded on national development demands, prioritizing R&D to provide solutions to society's critical problems. Strategies are vital to identifying strengths, weaknesses, opportunities, and threats (SWOT) and evaluating key performance indicators. From a small research institution to a renowned R&D Institute, KISR initiated its first five-year strategic plan (1980–1985), progressing to the current 9th Strategic Plan (2020–2025). KISR, embarking on a two-decade journey toward enhanced capacity building was one milestone during the 7th transformation (2010–2015).

Kuwait's Vision 2035 showcases a knowledge-based economy, the private sector as driving force to prosperity. Aligning this Vision with Kuwait National Development Plan (KNDP) was launched in the 2015–2020 8th Strategic Plan, subsequently in the 2020–2025 9th Strategic Plan, focused on how KISR can best serve and contribute to KNDP's main pillars, namely, energy, living environment, infrastructure, economy, and human capital. In conjunction, the research centers ventured into integrating their programs in line with this vision.

As stewards of Kuwait's applied R&D, KISR brings to fore science and technology (S&T) to bear on challenges implied in Kuwait's Vision 2035 via research and innovation around Flagship Programs, Artificial Intelligence, Big Data, and Business Technology Innovation. KISR remains committed to meeting S&T needs of clients and stakeholders to becoming a celebrated international Center of Excellence for Science, Technology, and Innovation, across multidisciplinary research programs.

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Introduction

Institutional strategic planning is the lifeblood of any scientific institution. As well, it is a fundamental approach to define the path and methodology to be followed toward an ideal investment and a balanced distribution of available resources to realize

the institution's mission and goals. It is a process of anticipating change, identifying new opportunities, and effecting strategies [1]. Strategic plans should focus on data and the manner by which these data could be used to propound realistic policies and goals [1]. Given the great need for information that supports real-time strategic decision-making, it is imperative for institutions to advance beyond traditional static data, and instead, be actively engaged in contemporary analytical methods and be the lead in this area [2]. Planning, if properly implemented, can have a powerful impact on advancing and transforming both academic and scientific institutions [3].

The Kuwait Institute for Scientific Research (KISR), which was established by an Amiri Decree in 1967, has since been formulating its 5-year strategic plans, the first of which was for 1978 to 1984, in collaboration with international institutions, such as the Battelle Memorial Institute, Ohio, USA. Since that first strategic plan, KISR has continued to develop and implement strategic plans at five-year intervals even in the wake of the devastation that hit its research facilities during the 1990–1991 Iraqi invasion of Kuwait. Albeit, KISR has, without delay, regained the helm of leadership as an applied research institution in the country and in the region.

During its initial construction and subsequent development, KISR has sought to attract qualified and capable scientists, especially Arabs and expats, both to participate in its research activities and train Kuwaiti nationals. KISR has been keen in its involvement and in honing national expertise in scientific research both through in-house activities and trainings abroad, to include scholarships for graduate and post-graduate education.

Kuwait's Vision 2035 describes a nation's dramatic transformation for the better within the next 15 years. The Vision showcases a knowledge-based economy, by which the private sector will have emerged as the driving force for financial prosperity and bigger opportunities, alongside with the government, efficiently and effectively confronting the nation's most crucial problems. It is a Vision that highlights new infrastructures, supporting a vibrant economy and healthy sustainable communities, and a well-protected, well-preserved environment, along with that of the State and its people [4].

The process of aligning KISR Vision with the Kuwait National Development Plan (KNDP) has since been initiated in the formulation of KISR's 8th Strategic Plan (2015–2020). However, it is a must to advance in the area of science and technology (S&T), it being the key to realizing this ambitious Vision.

In 2017, KISR celebrated its 50th Anniversary. The celebration gave KISR the prospect to look back to the numerous significant accomplishments and contributions to its stakeholders and the nation. By and large, in the coming years, KISR will be facing enormous challenges, but at the same time, celebrating breakthroughs and milestones with the overwhelming support from all KISR people from the management down the line. The Institute's contribution to the realization of the nation's Vision 2035 and the need to develop its capacity in digital technology will require the most focused, most creative fresh ideas and innovative efforts in the realm of Science, Technology, and Innovation (STI).

The Sixth Strategic Plan

KISR had its inception in 1967 as a small research institute with a limited number of personnel, mainly from Japan and Kuwait. It was established under an offset program between the Government of Kuwait and the Japan-Arab Oil Company. The main areas of research were focused on petroleum, agriculture, and fisheries. The Institute was initially managed by an administrative system headed by Japanese leaders. It was only in 1970 when the first Kuwaiti Director General, Dr. Mohammed Al Shemali was appointed. He set up the first research system and established laboratories for conducting applied research in the areas of agriculture, petroleum, and fisheries. The number of employees at that time did not exceed 50. In time, the Institute was inaugurated by Government officials, and an Amiri Decree was issued in 1981 to put forward the charter and to regulate KISR's research system. The mandate recognized KISR as an independent research institution in Kuwait and was provided flexible policies for institutional management and operation.

KISR's mandate underlined the research areas that the Institute should conduct relative to its R&D. These included, but are not limited to food, agriculture, marine science, energy, petroleum, and water. The first (1979–1984) and second (1984–1989) Strategic Plans were completed under a system of research programs, namely, Agriculture, Petroleum, and Techno-Economics. The Third Strategic Plan was focused on re-establishing the Institute after the complete inflicted damage during the Iraqi invasion of Kuwait in 1990–1991. The Institute developed a three-year Transitional Strategic Plan (1992–1995) to recover resources and restore the damaged laboratories and buildings with the core on keeping 'Partners in Reconstruction'. It was in the

Fourth Strategic Plan that the Institute started to expand its resources and its R&D program. The main thrust was to participate in development based on the national government priorities. KISR established five scientific divisions, to name, Food Resources and Marine Sciences Division, Water Resources Division, Petroleum Research and Studies Center, Engineering and Urban Development Division, and the Techno-Economics Division, in addition to other technical and administrative support divisions. KISR employed staff numbering more than 809, of which 95% were either Ph.D, MSc (or MA), BSc (or BA) or College Diploma holders [5].

KISR's Fifth Strategic Plan (2000–2005) constituted a transformational step with a vision for the new Millennium, with the aim of keeping abreast with scientific and technological development around the globe. It reflected great harmony with the current and even the yet-to-be realized technological and scientific developments, while coordinating the economic, productive, and developmental priorities in the State of Kuwait. The Fifth Strategic Plan was resolute on R&D in the divisions that have been established in the Fourth Strategic Plan with the achievements as follows: 97% of the Fifth Strategic Plan goals were reached through 194 research project contracts executed, of which, 69% were financed by beneficiaries, in a rundown as follows: 65% from the government, 16% from the private sector, and 19% from international agencies. In addition, 50 internal research projects, more than 73 scientific consultations, and more than 6000 technical services were carried out during the same period. Outcomes of research projects executed during the Fifth Strategic Plan (2000–2005) have been quality evaluated with very good and excellent reviews from international referees.

Some of the most remarkable accomplishments embodied in KISR's Fifth Strategic Plan (2000–2005) were the following: revision of the hierarchy and the resulting reductions of the number of research divisions from 6 to 5 and organizational units from 21 to 14; a merging of the Computer Unit with the National Center for Scientific and Technological Information; development of financial and purchasing procedures, and use of automation in operational procedures, resulting in greater control, facility, and flexibility in staff performance .

During the preparation of the Sixth Strategic Plan (2005–2010) [6], the emphasis was on curtailing the Institute's weaknesses by putting more efforts on effective marketing of its research outputs; developing a system for dealing with compensation and service requests; engaging a pool of researchers and specialists with

the needed expertise; compensating for difficulties in marketing scientific systems and innovations in the absence of technological and scientific incubators; and improving its limited long-term planning capabilities for lack of a national policy for scientific research, controlled financial allocations to scientific research by the government and private sectors (not to exceed 0.3% of the national income), and the failure of government authorities to abide by the Council of Ministers' decree in reference to KISR's scientific services and consultations, as required by such authorities.

Accordingly, a document referred to as 'Present and Future Trends' was released in the Sixth Strategic Plan (2005–2010), disclosing what needed to be looked into relative to the national R&D situations. These constituted the following: a dearth of clear scientific and technological policies, as well as suitable mechanisms for connecting scientific research activities and outcomes with technology transfer in national development, and investment incentives for scientific R&D outcomes, coupled with unequal competition from products and commodities produced in the developed world, in addition to, the relatively small local market. Apparently, some officials and private individuals do not as yet, realize the role of scientific research and technology transfer, with a consequent dependence on foreign expertise; and finally, infrastructure shortfalls in meeting the demands and requirements of scientific research playing a greater role in the various areas in need of development.

Overall, detailed goals and measures were called for to mitigate existing deficiencies and at the same time, achieve the specific targets within the plan period. Specific targets encompassed the research units, human resources, knowledge management, scientific consultations and technological services, administrative organizations, information and communications technology, and regional and international cooperation.

By and large, performance indicators also had to be prioritized to include the following: levels of research activities and consultative services attained (such as scientific production, scientific quality of outcomes, human resources, administration, media, and finance); preparedness of the scientific system, knowledge, and management (such as human resources, infrastructure, research facilities, and databases); KISR's status as a reference in S&T and as a think-tank to support Kuwait's decision makers; KISR's position in the local, regional, and international arena; KISR's scientific and technological cooperation and partnerships with regional and

international institutions; KISR's customer database; and the Institute's ability to develop individual financial revenues.

Transformation Plan

The 7th Strategic Plan (2010–2015) [7] was a fundamental rethink of KISR's mission and vision for the future. In developing a new vision for KISR, several key objectives were identified. First and most important, the vision had to be a shared foresight with broad agreement and consensus. Apparently, it must state the purpose of KISR and where KISR can add value to its chosen markets. The vision is novel, ambitious, and satisfies the aspirations of all of its stakeholders. Mindful of these objectives, and after reviewing vision statements from leading international Research Technology Organizations (RTOs), the following vision statement was adopted.

KISR VISION
By 2030, KISR will be internationally acknowledged as the region's most highly respected STI and knowledge gateway and recognized as a driving force for sustainable economic prosperity and quality of life.

In developing KISR's mission statement, some general principles were complied with. For the most part, the framework for the mission statement was set according to the Amiri decree with main elements to include conducting research; promoting science and technology; and providing advice and services.

KISR MISSION
KISR leads and partners internationally to develop, deploy, and exploit the best science, technology, knowledge, and innovation to public and private sector clients, for the benefit of Kuwait and others facing similar challenges and

To achieve the new and ambitious vision and accomplish KISR's expanded mission, a strategy was developed that provided a clear focus on KISR's applied research activities relative to long-term technological challenges. KISR's strategy also included a well-defined priority for critical support to national policy making. The strategy is based on five thrusts as shown in Figure 1 and described as follows:

- Become more customer focus, employing the outside-in approach

- KISR will concentrate more on a small number of key topics where the application of STI will help customers address Kuwait's challenges.
 - Improved service delivery, prompt promptness in the delivery of services and outputs, and consistent quality will be emphasized, particularly in the core project development and delivery cycle.
 - Closer customer partnerships will be fostered through a formal marketing and client engagement process with key accounts.
 - KISR's formal performance management process will drive and reward performance, aligned with customer focus and broader vision, mission, and strategy.
- Achieve international technology leadership.

Kuwait's national challenges are also global in nature. For its success, KISR will augment its STI capabilities by coupling with the efforts of others in order to deliver solutions or insights for effective policy. The Institute's capabilities encompass the following:

- KISR will focus on demonstrating technology leadership in chosen areas.
 - A higher bar will be geared up for the impact of KISR's R&D; new guidelines have already been expounded for publication in high-impact journals.
 - KISR will partner locally, regionally, and internationally, hosting collaborative multidisciplinary research programs with highly trained scientists and technologists.
 - An extensive modernization and facilities development program will be implemented to provide a state-of-the-art support to our scientists and engineers.
- Centers are to be set up in application-oriented areas.
 - In the near-term, four Centers of Excellence are envisioned, namely, Petroleum; Energy and Buildings; Water; and Environmental and Life Sciences. Over the long-term, other Centers will be established to support national priorities.

- R&D in each Center will be based on strategic programs designed to support solutions to national priorities by working closely with key clients (see upcoming section on National challenges)
- Each Center will be semi-autonomous, exclusively guided by an Advisory Council, comprising key clients, scientists, and stakeholders with the expectation that they can grow into independent Research Centers in the future.
- A solid and thriving commercialization capability is envisioned.
 - KISR will focus on the potential for commercializing efforts from each of its program initiatives.
 - Appropriate legal frameworks, mechanisms, and processes to enable commercialization will be developed.
 - KISR will create a pipeline that provides a flow of technology and business opportunities.
 - Specialized resources (funds, intellectual property management, etc.) and corporate venturing/incubator facilities will be pursued.
- A culture of achievement and excellence is projected and will be nurtured.
 - A new generation of leaders who espouse KISR's new values and who intend to serve as role models will be worked up.
 - Performance Management will be instituted to add in setting performance objectives at the senior management level fixed on the five strategic thrusts, reinforced by an aligned performance planning, appraisal, and development (PAD) process for all staff.
 - Management will highlight its efforts on proactive institutionalization of this culture of achievement by a daily living of the values as role models and fostering a motivated supervision and reward system for staff's appropriate behavior.

The developed strategy would require that KISR should also develop the capability to initiate new thrust areas, prioritize current ones, and rethink the manner it conducts current activities. This would entail the redesigning of an organizational structure that

supports transformational change. After considerable assessments, the decision has been to organize KISR's research and technology capability into four centers, to name, Petroleum; Water; Energy and Building; and Environment and Life Sciences (Figure 2). In the heart of these Centers has been to contribute solutions to national challenges.

In addition to the existing Administration and Support Services sector, two new sectors have been established, as such: Science and Technology (S&T) Sector and Marketing and Commercialization Sector. The S&T sector is to oversee the following: lead the development and implementation of KISR's long-term S&T strategy, ensure that KISR develops and maintains its scientific excellence and incubates new centers for the future, such as techno-economics. Currently, the Techno Economics Division has developed a strategy for two programs, namely, Economic Public Policy and Private Sector Development. Meanwhile, the Marketing and Commercialization Sector supports the development of client-engagement processes, as well as the exploitation of KISR's research for commercial purposes.

The new structure is directed at growth and evolution, incubating new centers and spinout companies to meet Kuwait's developing needs. Currently, the Techno-Economics is to be incubated in the S&T Sector and will be considered far ahead for a center status. Finally, given the significance of the construction sector and KISR's developing capabilities, a separate Infrastructure and Buildings Center may be contemplated in the future.

Steps in Strategic Planning Development

The planning process begins with an assessment of the current situation. The senior leadership and the Board have agreed that a systematic appraisal of KISR's current effectiveness would be essential if a robust vision and plan were to be developed for the future. KISR has contracted with an outside firm, specialized in working with research and development organizations, to help conduct this assessment. The assessment included a detailed analysis of stakeholder's technology requirements and the alignment of KISR's activities with those requirements. Such an evaluation had to include a detailed look at KISR's internal policies and procedures, and their impact on both client and staff satisfaction and effectiveness. Concisely, the results strongly indicated that a major transformation of KISR would position it to render the types of contributions necessary to meet KISR's priority needs, satisfy clients, and make KISR

the type of workplace wherein the best scientific and engineering talent would want to engage his best potentials.

Following the assessment, the next step in the process was to put together and execute a plan for accomplishing the necessary transformation. Key elements of this phase of the work included clarification of KISR's mission and vision, definition of the core values that demarcate KISR's desired culture; identification of the strategic changes (thrusts) that would be necessary to achieve the desired transformation; creation of a new organizational design, reflecting the mission/vision and the requirements of the strategic changes, with the higher level design of the process modified to make of KISR a more effective organization. Most of the changes have been implemented as part of the strategic planning process; alternatively, other modifications will be implemented over the course of the upcoming years.

Conclusively, and the key part of the process, is to have realized that the best avenue to meet stakeholder and client needs was to reorganize KISR's applied research programs and combine them into a set of sector-oriented centers of excellence. Working with clients, stakeholders, and outside experts, KISR has identified twenty-eight priority applied research programs to be grouped into four Research Centers and one additional unit, hosting two programs. Detailed strategic plans were then developed for each center and program, drawing on input from clients, stakeholders, and outside experts. An example of this strategic plan is presented in Figure 3 for the Environment Life Sciences Research Center (ELSRC).

If truth be told, completing the assessment process has opened new doors for KISR to have been aware of a greater responsibility for seeing that research should be used to generate practical applications. As a partial response to this challenge, special attention was given to increasing the sophistication and impact of KISR's marketing and commercialization activities.

As part of the assessment process, it was determined that virtually, every process within KISR should be re-engineered to support KISR's vision/mission and to be better aligned with the new organizational structure. Teams of KISR and consultants have been deployed to develop "to-be" models for each process and to create a plan for implementing those changes within a stipulated time frame. These major changes targeted at finance, purchasing, human resources, research management, and performance management processes.

At length, but most importantly, the many systems and activities are being put in place to make of KISR the best workplace for the best science, engineering, administrative and support talent in Kuwait and in the region. Our ability to invest in, motivate, reward, and support our people will ultimately determine whether this transformation effort would indeed be successful for Kuwait, KISR clients/stakeholders, and KISR by itself, in, and of itself.

Evaluation of KISR's Current Effectiveness in Supporting Kuwait

Before addressing the future of KISR, its vision, mission, and strategic direction, a comprehensive review of KISR's current effectiveness in providing value to the state of Kuwait was conducted. An international consultant, Arthur D. Little (ADL) was hired to support KISR staff with this strategy development process. The process consisted of four elements, to wit: an external and internal assessment of KISR's current performance by key stakeholders; a self-assessment of KISR's current capabilities and constraints; a benchmark study, comparing KISR with comparable international research and technology organizations; and an analysis of the challenges faced by key sectors of Kuwait's economy and quality of life. This set of information has helped to formulate the new vision, mission, and strategy.

Assessment of KISR by Key Stakeholders

The first step in the strategy development process was to interview both internal and external stakeholders to obtain a clear perspective on the key issues and priorities to be addressed. Sixty-five internal and twenty-five external stakeholders preapproved by senior management were interviewed using a formal interview protocol. Interviews were conducted with all key parts of the organization, including research and administrative support. External stakeholders consisted of key clients for each of the research divisions.

External stakeholders seemed to have presented a shared standpoint, that while KISR has somehow maintained its brand image, still there are things to be desired; responses harbored on the following: improvement of service delivery, particularly delving on core development and delivery cycle, being of critical importance; the Institute, to use a more client-focused approach; consistency in the high quality of its outputs; a focus on key topics, even less in quantity, but aimed at creating a difference;

brand image as a provider of research, but delivery is not matching the promise that the brand carries; positive goodwill is substantial, but contingent on expected improvements in KISR's research and service delivery processes.

On the other hand, internal stakeholders had these to say, as follows: that the key processes driving KISR's organizational performance need upgrading and cultural barriers within departments have led to poor teamwork and low morale.

The implications of these findings have been incorporated into the new strategy. This includes the need to have more focus in KISR's research activities and better prioritization of efforts that will provide substantial benefits to Kuwait. This intensified focus will need to be balanced against the continuing need for KISR to play a broad role within the nation's Science, Technology, and Innovation (STI) framework, given the relative scarcity of other institutions to play that role. An urgent priority will be to underscore on client service delivery that will require increased client focus and implementation of process improvements. Finally, there is a need to create a more open organization, to include objective and transparent performance reviews.

Institutional Self-Assessment

The next step in the strategy development process was to obtain information on each of KISR's divisions and gain perspective on their performance, capabilities, and resources. Each division generated a self-assessment report, highlighting its historical strengths and achievements; future ambition and barriers to attaining this ambition; and current resources and performance. A series of meetings were held to review current activities and assess the value they were adding to identified clients.

The highlights of the self-assessment report covered the following:

- KISR work has focused on applied research.
- Resources are spread too thinly across many sectors.
- For a longer time, there has been the uneven distribution of resources across divisions; allocation of resources has not been aligned with Kuwait's priority needs.
- Except for the Petroleum Research Center (PRC), there has been an increase in project funding from internal KISR sources (as opposed to client funding).
- Significant differences exist in scientific outputs between Kuwaiti and expat researchers.

- There is a lack of effective collaboration across divisions (e.g., no incentives or policies for matrixing).
- There are additional manpower requirements for areas of KISR which are below critical mass.
- The proposal development process is slow.
- Lack of availability of skilled technicians to maintain facilities and capabilities.
- Low recognition of the importance of research and development (R&D) in Kuwait.

The implications of these findings were important in developing KISR's new strategy. Specifically, there is the need to focus and prioritize more to be effective in allocating limited resources. The organization needs to promote cross-functional teams and application-oriented programs to break down barriers between and among divisions and departments. As a final point, KISR needs to reinforce a culture of achievement throughout its operations.

The 8th Strategic Plan

The 8th Strategic Plan (2015–2020) [8] could be considered a transformational plan that has led to a broader and more ambitious strategy, focused on Kuwait's National Strategy, reorganization, and new leadership, and began the development of improved processes for KISR. In the core of the 8th strategic plan was to confirm those applied research areas where KISR should focus in and to identify the type of organization and supporting processes indispensable to promoting KISR's success.

The 8th Strategic Plan also envisioned the longer-term development process illustrated in Figure 4. As indicated in the Figure, over the course of 20 years, KISR has since aspired to become an International Center of Excellence in applied research and technology in areas of strategic importance to Kuwait and the region. The period covered by the 9th Strategic Plan pertains to the objectives covered in the second and third blocks of the Figure. Specifically, KISR needs to have mastered the process of flawless delivery and to have demonstrated its relevance to national clients, as well, to have begun the process of having regional and broader impact through its research programs during this period.

For the 8th Strategic Plan, much effort was expended on determining the general scope of KISR's research programs, its major client sets, and the organization that has

been optimal for meeting the needs of these clients. This effort included extensive engagement of KISR stakeholders, benchmarking of important research and technology organization structure and processes, and development of a new mission, vision, and values for the Institute. The results of the 8th strategic planning effort are robust; the road map laid out in the 20-year vision remains viable at the institutional level. In this fashion, not all aspects of the approach used for the 8th Strategic Plan need to be conducted in the preparation of the 9th Strategic Plan (2020-2025).

Way Forward in Strategic Planning

The 9th Strategic Plan (2020–2025) [9] has laid out an integrated approach for achieving the important institutional goals as follows: continuing service to KISR clients and stakeholders with high value, high quality solutions to their crucial problems, addressing the priority objectives of the National Development Plan in areas where KISR has comparative edge and significant contributions to enhancing KISR’s R&D and innovation products and services, optimization of KISR’s resources, improving income generation and continuing the Institute’s efforts to boost up its international reputation and its impact in applied science and technology.

The 9th Strategic Plan, however, will emphasize on issues and concerns that could not be addressed systematically during the Transition Project. These are several of these concerns to wit:

- Centers and research programs will be expected to direct their resources to meeting the priority elements of their strategies, which would mean commitment with a high level of confidence and a firm resolve to decide on supporting more important activities.
- Centers are demanded to consciously select a portfolio of activities across their research programs to assure putting in place the following:
 - Innovative solutions to important client or market sector problems are realized within the five year-period of the plan. The Centers must commit to and actively manage the development of innovations that will have positive impact on key clients and stakeholders, gain for KISR the reputation as an innovative organization, and position KISR for longer-term success.

- High-quality, near-term delivery of research and services tailored to the priority needs of key clients. The Centers and program strategies must include elements designed to elevate the relationship between KISR and its key clients to the level of at least ‘preferred provider’ and preferably, a strategic partner.
- The steps for executing the proposed strategy are foreseen to be more specific and detailed with greater attention paid to the factors that may enable or disable the strategy. Particularly with respect to process improvement within the Sectors and capability development in every organizational unit, it is anticipated that the strategy be supported by something closer to an implementation or project plan.

Challenges to Strategic Planning

KISR’s challenges during the first two and a half years of its 8th Strategic Plan implementation have been mainly due to the external macro-economic developments leading to lower oil prices, and consequently, to new government policies that have adversely impacted KISR’s budget and operations. In addition, the closure of both Wafra Joint Operations (WJO) and Khafji Joint Operations (KJO) since 2015, has also affected KISR’s revenues. These were exacerbated by several internal challenges that spanned organizational-related issues including the following: appointment of new managers, capacity building and difficulty of retaining and attracting new R&D talents, limited availability of private sector’s R&D funds, and shortcomings in the implementation of new processes that hampered operational excellence. In addition, KISR Management had to deal with some of the past problems, as well as the new restrictive directives/policies of the regulatory government institutions, all of which have negatively encumbered KISR operations.

Evaluation of KISR’s Accomplishments - SWOT Analysis (2015–2017)

To evaluate KISR’s accomplishments during the period 2015–2017, a SWOT analysis was undertaken by the Advisory Committee to highlight the strengths,

weaknesses, threats, and opportunities of KISR's achievements and progress during this period.

- In view of the major **challenges** that have been facing KISR during the last two years, the Upper Management, supported by the Research Centers and Sectors, succeeded in addressing many of them through a number of initiatives/actions spanning KISR organization and processes, capacity building, KISR clients and stakeholders, and operational excellence.
- **Weaknesses** are mainly related to the macro-economic developments and lower oil prices that have adversely affected KISR's budget and operations. Simultaneously, KISR has been facing other internal challenges, some of which have been dragging for some time before the new management took charge in February 2016. These have all negatively weighed down KISR's overall productivity during the 1st two years of the 8th Strategic Plan implementation which included the following: high staff turnover and difficulties of retaining competent staff, Kuwaitis and non-Kuwaitis; difficulty in recruiting new proficient talents; Government's budget cuts and limited private sector's R&D funds; lower number of Centers/Programs' R&D activities for reason of inadequate KISR funds that have hindered number of projects, and consequently, the number of publications in internationally-refereed journals; cancelling of new GPC projects that were originally approved, thus adding to the reduction of the 2018/19 budget; inadequate number of senior scientists to help mentor junior staff; elimination of incentives, thus, adversely affecting the research staff morale and negatively obstructing the culture of achievement and shortcomings related to the implementation of some of the new processes that were developed in line with the new organizational structure.
- **Strengths** included, KISR's outreaching efforts to expand its client base that have ended in fruition, particularly the cultivation of new clients, such as Kuwait Direct Investment Promotion Authority (KDIPA) and bolstering R&D/Technical services' activities of KISR through collaboration with Kuwait Petroleum Company /K Companies, results of which will be more evident in the upcoming few years; resumption of Kuwait Environmental Remediation Program (KERP) activities with Kuwait National Focal Point (KNFP) with expected significant revenues; embarking on strengthening strategic alliances

with the private and public sectors; and initiation of work to establish a business unit to augment KISR's revenues. In addition, several of the Upper Management initiatives/actions contributed to the improvement of KISR's operations including development and approval of new policies, streamlining of operational processes to facilitate research centers' operations, developing of an institute-wide Quality Management System (QMS), developing a Laboratory Information Management System (LIMS), to start with the Petroleum Research Center, establishing an occupational safety system, initiating work on a structured plan for management and early-career technical staff career development and continuing the upgrading of KISR's infrastructure.

- KISR still faces a number of **threats** traversing the uncertainty in the allocation of KISR's R&D budget due to the fluctuation of oil prices, new restrictive government policies related to hiring of competent talents, as well as the entanglement of KISR with the constricting rules and regulations of the government financial and legislative institutions, thus, adversely affecting KISR's flexibility to exercise its role as an Independent Institution, as well as inhibiting its productivity.
- On the other hand, KISR has potential **opportunities** that the Institute can benefit from, including but not limited to, strengthening its technical outputs and innovative products/processes through the implementation of high-national impact Flagship Projects in collaboration with local/international alliances; promoting engagement with external stakeholders through the establishment of the KISR Advisory Council, KISR Research Centers Advisory Boards and KISR/Kuwait Foundation for the Advancement of Sciences (KFAS) chairs of distinguished scholars; enhancing KISR innovation ecosystem through the establishment of Center disciplines and increasing KISR's revenues via the creation of a new KISR's business unit, and establishment of KISR's technical incubators.

Information generated as a result of the Mid-Term Review, along with the lessons learned during the first two years of the implementation of KISR's 8th Strategic Plan, provided significant insights on the necessary actions that KISR should undertake to move forward during the remaining period of the 8th Strategic Plan. It also provided

good judgment on how to optimize the impact of KISR's 9th Strategic Plan (2020–2025), as well as on how to enhance the Institute's contributions at the national level.

Implementation of the recommendations that are detailed in the report, will not only help KISR to achieve the set objectives of its 8th Strategic Plan, but will also lay down the proper background and goal-setting theme for its next Strategic Plan, starting 2020 to 2025.

As for the way forward, it is anticipated that KISR's next Strategic Plan will be aligned with Kuwait's national priorities as reflected in Kuwait's development plan, goals/objectives, and vision of 2035. Close cooperation with the Supreme Planning Council for Sustainable Development will be sought out. However, in preparing the plan, due consideration should be given to worldwide trends and leaping advancements in technology development and their implementation, in addition to the international competitiveness arena and the information age mindset toward open innovation that runs counter to secrecy and silo mentality.

KISR's next strategic plan should focus more on innovation, stressing international collaboration and allocation of the essential resources to ensure its successful implementation. In addition to the technical development support to KISR clients that KISR is committed to provide, KISR's next strategic plan should focus mostly on how KISR can expand its intellectual property (IP) portfolio and enhance its commercialization activities through the execution of flagship projects that have significant bearing at the national level. Execution should be via a structured matrix system, internally, as well as at the national level, and in collaboration with international alliances.

Correspondingly, KISR should breed the appropriate and relevant technology platforms that will support KISR's cross-cutting capabilities, such as computational science (big data analytics) and simulation, separation technologies, etc., that would position the Institute in meeting national needs, inherent in the nation's future goals. Entrepreneurship should be given due consideration and instituted through the development of appropriate incentives to encourage the culture of innovation and inventors at KISR. The Centers/programs have to be the driving force behind increased openness and in embracing internal and external cooperation. All of KISR organizational units and available resources should be aligned and managed through a collaborative framework in line with the Institute's set objectives and expected deliverables. The close cooperation with the Business Community is required, and

KISR should dwell on the promotion of Business Incubators in collaboration with the private sector.

Conclusion

For the State of Kuwait to meet the Sustainable Development Goals (SDG 9) Target 9.5, which states—

“Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular, developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending”—

it is necessary to develop a national policy for STI. KISR has developed its 9th 5-year Strategic Plan (2020–2025). Notwithstanding, a new policy for R&D and STI should be decreed by the government. KFAS and the Secretary General of the Supreme Council of Planning and Development (SCPD) are currently working with multifarious relevant institutions to provide an international perspective on the Kuwaiti STI system and policies in collaboration with the Directorate for Science, Technology, and Innovation of the Organization for Economic Cooperation and Development (OECD). The OECD will review innovation policies in Kuwait to offer a comprehensive understanding of the strengths and weaknesses of a national innovation system and the opportunities to enhance it through government policy. It is also envisaged that this review and its recommendations will impart vital international perspective for developing priorities in R&D for KISR’s 9th Strategic Plan (2020–2025).

The Arab Strategic Plan for STI recommends to Arab countries to augment R&D expenditure [10]. The source of KISR’s budget is from both the Ministry of Finance and Client/Customer income. However, the annual generated income is fully transferred to the Ministry of Finance, which allocates its annual budget based on the expenditure and income generated annually. Therefore, it is necessary for KISR to upgrade and design its financial system to allow efficient management of financial-related matters in the strategic plan. The links for increasing income would be through improving, not only the relationship with clients/partners but also, the quality of products and research outcomes. Commercialization of KISR outcomes has been markedly specified in the objectives of KISR’s 7th and 8th Strategic Plans.

Nevertheless, heightened efforts are imperative to succeed in achieving this objective in the 9th Strategic plan. Human resources call for quality recruitment, training, and competent leaders who can offer the best solutions and productivity in a healthy environment.

Flagship Programs are to be launched from where will be drawn the talent and know-how from across the Institute to address the enormous complex challenges identified in Kuwait's Vision 2035. In this program, and in every endeavor, our success will depend on each and everyone, furthering and participating in a culture of open communication, mutual respect and support, continuous learning and improvement, and client service. Recruitment of young Kuwaiti scientists and provision of the state-of-the-art training in R&D and innovation will also be a priority goal in this 9th Strategic Plan.

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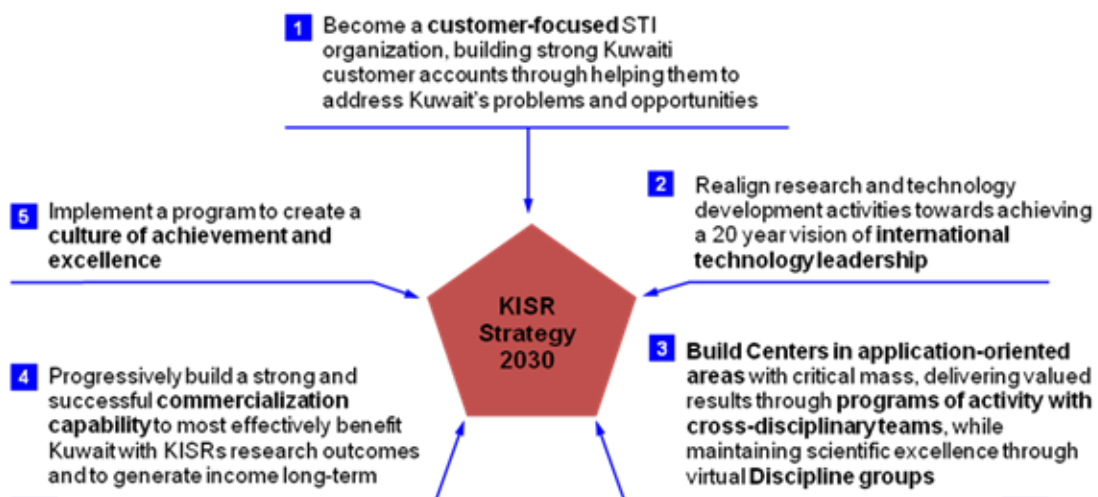


Fig. (1). The five thrusts of the 7th Strategic Plan of Kuwait Institute for Scientific Research (KISR).

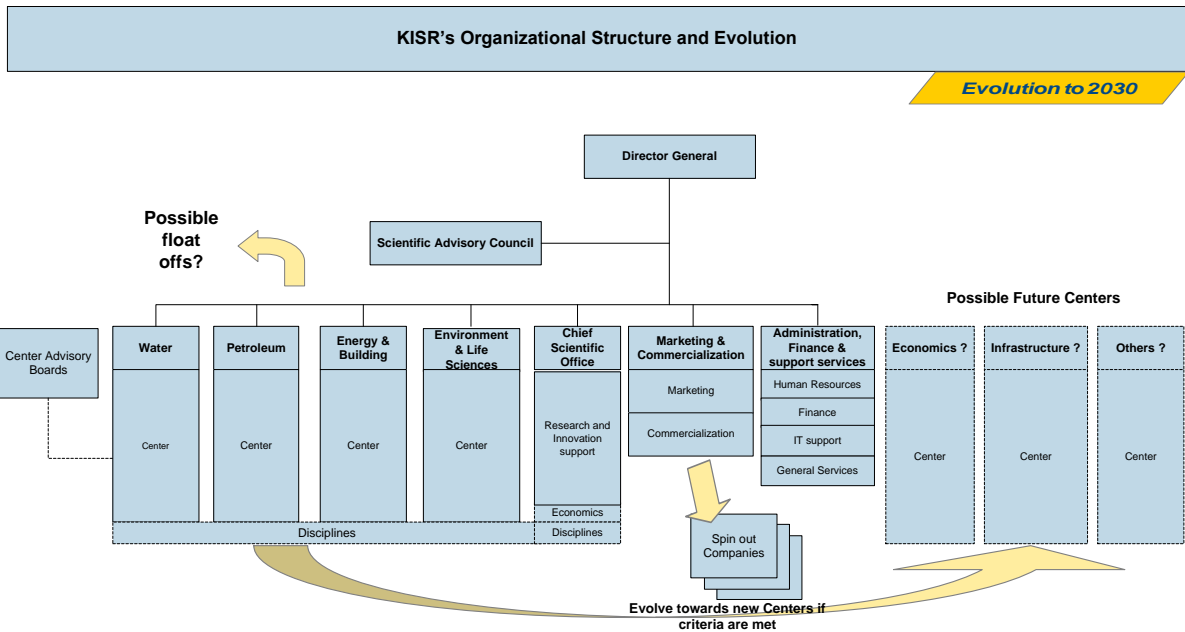


Fig. 2. Organizational structure of Kuwait Institute for Scientific Research in the 7th Strategic Plan.

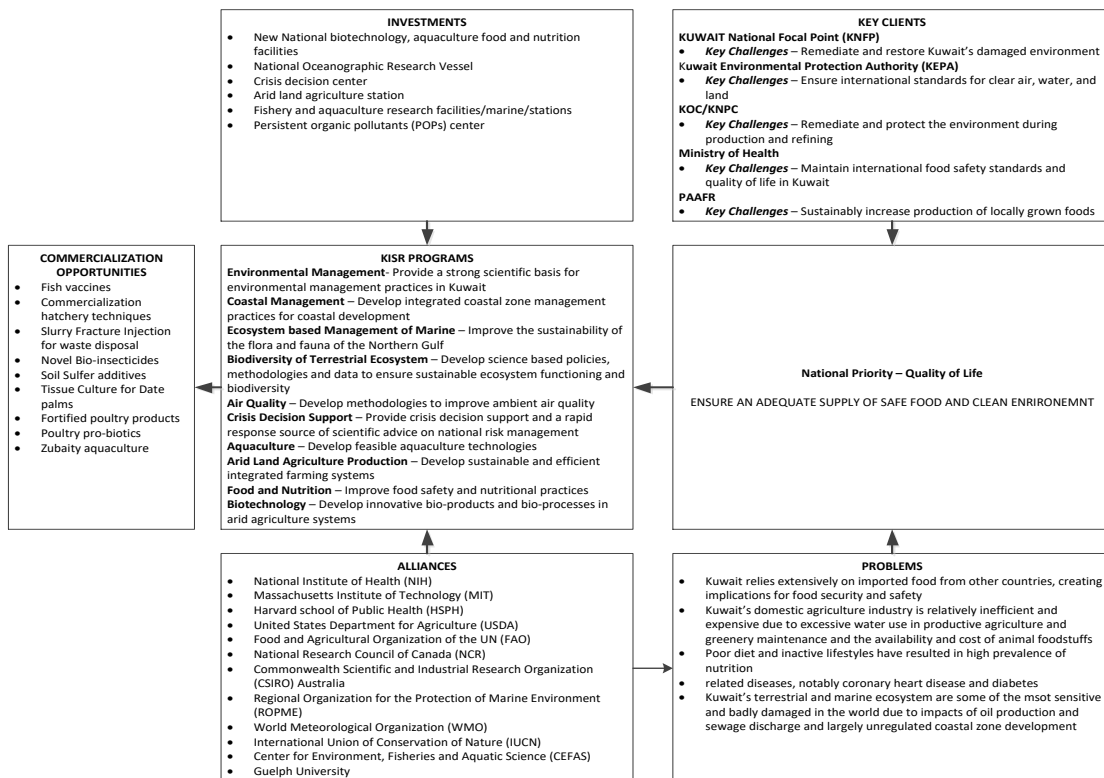


Fig. 3. Outline of the Environment and Life Science Center Strategic Plan in relation to the national priority – quality of life.

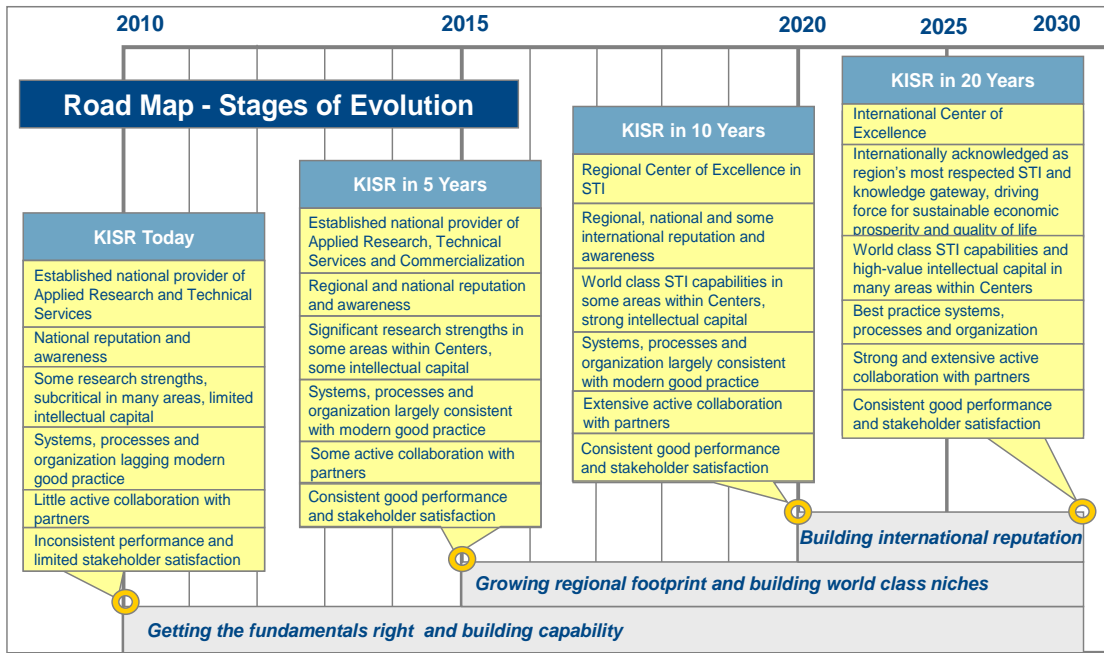


Fig. 4. Kuwait Institute for Scientific Research (KISR) road map focus for the 9th Strategic plan.