



جامعة قطر  
QATAR UNIVERSITY

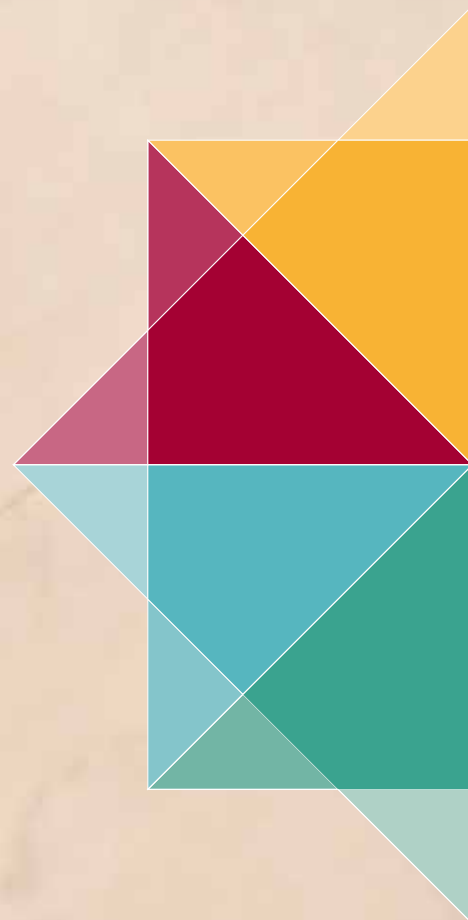
# Research for the Future

Road map of research at  
Qatar University **2014 - 2019**



## Road map of research at Qatar University 2014 - 2019

-  **Energy, Environment & Resource Sustainability**
-  **Social Change & Identity**
-  **Population, Health & Wellness**
-  **Information, Communication & Technologies (ICT)**



### Background and Brief Overview

The 2013-2016 strategic plan of Qatar University delineates key research priority themes on which research effort of the University will focus during the coming five years. These priority themes are based on the country's future developmental needs as stipulated in many of the national documents such as Qatar National Vision 2030, Qatar National Development Strategy 2011-2016, Qatar National Research Strategy 2014 and Qatar University Strategic Plan 2010-2013.

The four priority themes were identified following a systematic process involving meetings and workshops with faculty members from all colleges and research units within the University, and with input from stakeholders and international collaborators. The priority themes are also based on current research strengths of the University as evident from existing expertise, recent publications, available resources and infrastructure, and future global research trends in pertinent areas.

**Process** The VP for Research (VPR) formed four committees comprising discussion groups made up of faculty members and researchers associated with the individual priority themes/subthemes listed in the strategic plan. Each committee was charged with the development of a road map for implementing research proposed for each of these themes/subthemes. The committees initiated the task in December 2013 and submitted their findings in February 2014. A summary of these findings, along with broad recommendations for implementation of the plan, are presented in this report.

Essentially, the report outlines key objectives within each of the priority themes/subthemes, catalogs available expertise, resources and infrastructure, and provides an overview of future needs for successful implementation of the research plan laid out for each priority theme/subtheme. As an assessment report, this document lays the foundation for the next step that envisions extensive engagement of faculty members in all academic and research units within the university in a highly competitive process that will crystallize a comprehensive work plan for launching an interdisciplinary and interactive program

within or across sub-themes outlined in the four research priority themes. The basis for this is to set the stage for the university to launch these programs in a stepwise manner, and thus fulfill the aspiration to be a regional leader in these themes during the next five years.

**Need for a coordinated university-wide effort** Once the research road map is adopted by the university, it is imperative that the university lays out an implementation plan that outlines and ensures how each theme/subtheme will be strengthened during the coming years. This will also require creation of a support mechanism, internally as well as in association with various stakeholders that will initially stimulate the strengthening of these themes/subthemes. The next phase of growth and sustainability is envisioned through increased extramural funding.

**The goal of the VPR Office** is to roll out a highly competitive yet intensively engaging process for the identification of at least three subthemes (from among the twelve outlined in the four priority areas) for launch by January 2015. It is envisioned that other subthemes will be launched during subsequent months/years as various metrics associated with prioritization of each of the programs are met. Tentatively, request for competitive proposals will be issued by the end of June, while proposals will be received by the end of October, and a decision on proposals made by end of Fall Semester 2014.

The main research priorities were divided into 4 main themes. These are energy, environment, and resource sustainability; social change and identity; population, health and wellness and information and communication technologies (ICT). Each of these themes was divided into subthemes that were the basic units upon which the committees worked and submitted data. (See themes on page 4)

# Themes and subthemes of the main research priority areas of Qatar University





## Theme 1: **Energy, Environment & Resource Sustainability**

### **Theme 1: Energy, Environment & Resource Sustainability**

Energy, environment and resource sustainability are issues of prime importance to the country because Qatar's economy is based on hydrocarbons production and processing. These fossil fuel resources have also adverse environmental effects that may impact the natural environment components such as water, air and soil. Preservation of such natural resources is critical for the success of the food security program which the country is embarking on. Researchers at Qatar University conduct research to minimize these adverse effects and mitigate the consequences of the environmental pollution. This is also achieved through investigating other resources such as solar energy and biofuels, developing new materials as well as conserving and developing the country's natural marine resources.

**This theme is divided into four subthemes. These are:**

- 1.1 LNG and Alternative Energy
- 1.2 Materials and Nanotechnology
- 1.3 Marine Resources
- 1.4 Water, Air and Food Security

#### **1.1 LNG and Alternative Energy**

Liquefied Natural Gas (LNG) is a major source of revenue for the State of Qatar. In fact, the Qatari experience in large-scale processing of natural gas is becoming an international phenomenon and has been instrumental in significantly improving the efficiency of the process and reducing its environmental impact. Earlier, Qatar University dedicated a research center - the Gas Processing Center (GPC) - to conduct research in this important discipline with faculty members in College of Arts and Sciences (CAS) and College of Engineering (CENG). GPC regularly organizes a conference on LNG that has become the centerpiece of international attention and interest. The proceedings of this conference are routinely published for dissemination of cutting-edge discoveries reported in the presentations. Considering these strengths, it is imperative that QU further intensifies advancement in the area for maintaining global prominence and attracting international enterprises (educational & private sector) for novel discoveries that increase production efficiency.

Next, in its endeavor to diversify the national economic resources and to shift gradually to knowledge-based economy, Qatar is eager to exploit alternative energy resources such as solar energy and biofuels. Researchers at Qatar University are already engaged in this effort including the facilities at CENG and the Clean Energy

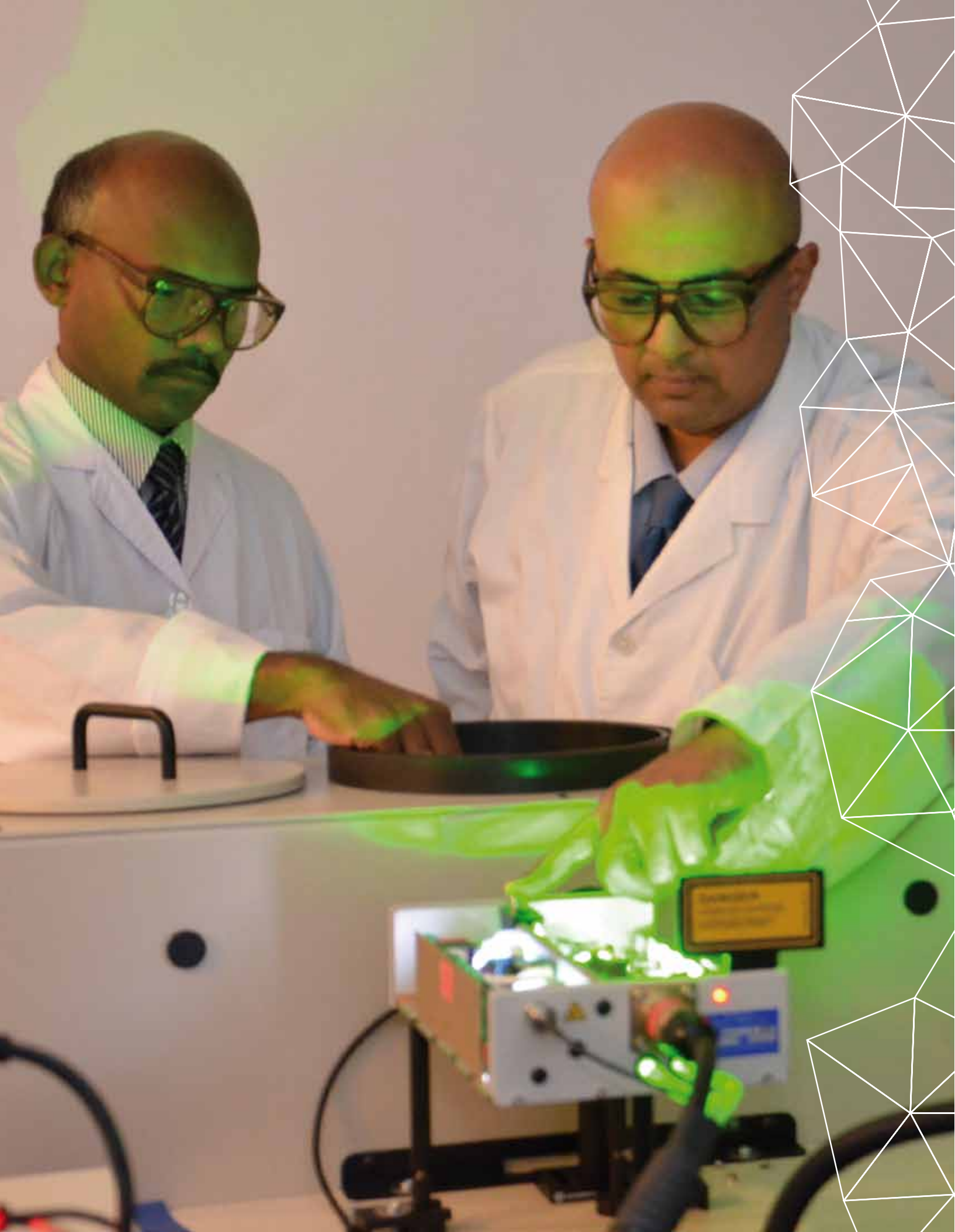
& Energy Efficiency Research Group at CENG in particular. There are more than twenty researchers conducting research in LNG and alternative energy mainly in CENG and CAS. The biofuel project at CAS is an example of such research. Moreover, solar energy is strategically a natural energy resource that is abundant in the Gulf/Mid-East region and would be ideal not just for Qatar but for the entire region. Presently, this resource is not optimally exploited in Qatar. Hence, QU would like to contribute to this effort by laying a solid foundation for research through a dedicated program.

QU has constantly invested in strengthening infrastructure support for their type of research. Notable are the Nanosecond Laser Spectrometer (CAS) and the facilities and equipment at the Gas Processing Center (GPC) and the excellent facilities at CENG and Center for Advanced Materials (CAM). External partners like Qatar Science and Technology Park (QSTP) and Qatar Airways are actively engaged in collaborative research with the university, thus sharing valuable expertise and resources. The major stakeholders of this subtheme are Ministry of Energy, Ministry of Environment and Qatar General Electricity & Water Corporation (Kahramaa).

The main research program will be alternative energy, solar energy, energy efficiency, LNG and GTL as well as the science and economics of the shale gas deposits, the economic impact of the continuous discovery of oil and gas in other parts of the world and the evolving law in gas contracts. Research in the alternative energy area will be enhanced by recruiting three faculty members in solar and renewable energy. Additionally, there is a need for establishing an advanced solar energy and photo processing lab.

There is also a need for M.Sc. and Ph.D. programs in solar energy technologies and applications (with the Chemistry and Earth Sciences, CAS) as well as in LNG technologies and applications (GPC Engineering/Engineering) to train the students from the region and provide highly qualified workforce for various industries from amongst the local population.

Qatar is considered as the "world's capital of natural gas". In order to maintain its global leadership in this area the university must invest in resources and infrastructure that will allow future advancement in this field and attract closer/increased collaboration from the industry. Moreover, it must be emphasized that strategic investment in alternative energy resources will position QU and Qatar as leaders in the region for innovation and development.



## 1.2 Materials and Nanotechnology

Materials science and nanotechnology are futuristic, interdisciplinary fields that cover a wide spectrum of disciplines and technologies. They have wide-ranging applications in strategically important fields such as energy, environment, water, medicine, material safety, economy and sustainability.

Various colleges and research units at QU, including the Center for Advanced Materials (CAM), are conducting research on a variety of topics within the two fields. Prominent among these are two areas of high industrial significance, viz., i) preventing biofouling and corrosion, and ii) developing novel technologies and resources for renewable energy utilization. Corrosion and biofouling of the surface of ship hulls, pipelines, marine components, membrane reactors, cooling water systems of large industrial equipment and other apparatus has become a huge environmental and economic issue for Qatar industry. It can also affect pipelines carrying oil with entrained water, especially those carrying used oil. Government and industry annually spend several hundreds of million US dollars to prevent and control marine biofouling.

Next, the creation of novel devices for renewable energy utilization, particularly capture and utilization of solar energy, is of high importance to Qatar and neighbouring countries, largely to diversify the currently rather limited sources of revenue, and develop alternative clean energy technology. This requires development of fundamental understanding of material synthesis because safe, cost-effective and efficient devices are essential for solving the global issues of energy shortage and environment pollution. QU will immensely benefit from investing in these two key areas primarily due to their economic impact and industrial needs.

There are around 40 faculty members affiliated with GPC, CAS or CENG conducting research in the materials and nanotechnology areas mainly in collaboration with CAM. The research of this sub-theme spans across several colleges and centers/institutes. Excellent research facilities and infrastructure exist in these units for material synthesis, characterization and testing. The sub-theme is a classic example of interdisciplinary research at the University. Moreover, there are more than 14 stakeholders including Qatar Petroleum (QP), Qatar Petrochemical Company (QAPCO), Qatar Aluminium (QATALUM) and Qatar Steel that closely interact with the group.

For strengthening the two key focus areas described above, there will be a need to recruit three distinguished scholars with a record of accomplishment of outstanding research. Additionally, recruitment of skilled supporting staff, infrastructure in terms of equipped laboratories for testing of large structural frames against biofouling and corrosion, training of personnel, and for casting and surface modification of nano materials, will be a priority. Creation of these facilities and recruitment of expertise will also allow initiation of a Ph.D. program in Applied Sciences and Nanotechnology. Jointly, the research and graduate program will bring considerable visibility of the University regionally and globally. Most importantly, the issues addressed through these enhancement initiatives will allow the university to i) provide viable solutions to key burning problems locally and globally, and ii) serve as a hub for learning in the two fields in the Gulf region and beyond.



### 1.3 Marine Resources

Qatar is a peninsula and the sea is an integral part of the life and culture of most Qataris. Pearl was the pre-oil primary source of income and fishing was, and still is, a vital profession in the country. There are also some important marine resources in the Qatari national waters such as coral, sea grass and marine turtles. Other marine resources such as fungi also represent an important source of marine drugs. Human activities including the exploration and production of hydrocarbons in the marine environment have rather negatively affected these resources.

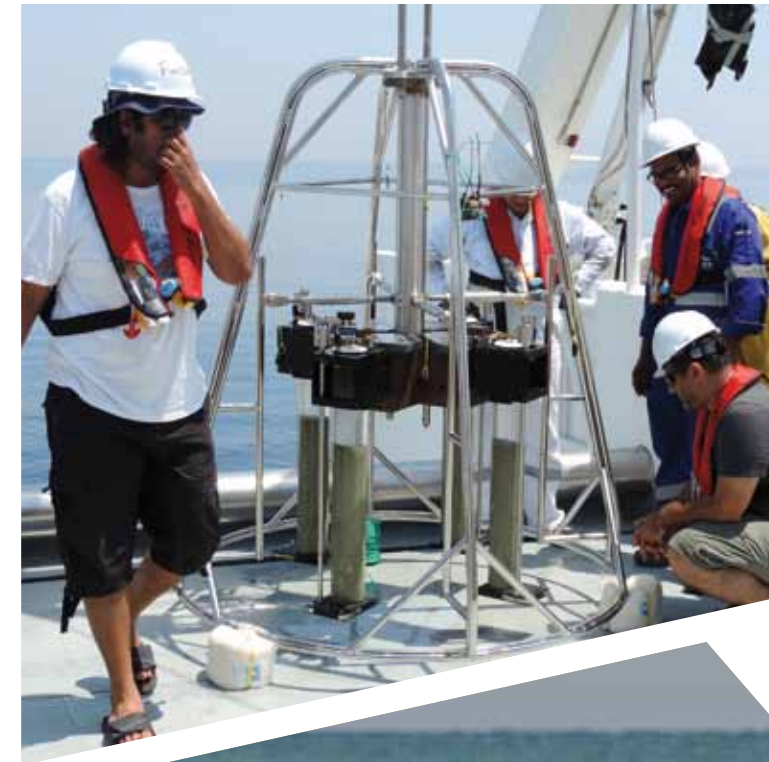
Qatar University was in fact a front runner in catering to requirements for marine studies by purchasing the old research vessel Mutkhabir Al-Behar in 1982 and establishing the marine science program that graduated many of the marine scientists in the country. Two years ago, the university acquired a more sophisticated research vessel (Janan) coupled with other powerful survey assets like speed boats and advanced analytical facilities such as the laboratories at the Environmental Studies Center (ESC), the Central Laboratories Unit (CLU), the Department of Biological and Environmental Sciences (CAS), and the new facilities at the College of Pharmacy. Colleges and centers involved in research in this discipline include CAS, CENG, ESC and College of Pharmacy.

The number of marine scientists in the University (around 10) is still low compared to the huge investment in physical assets. The early closure of the marine science program limited the ability to hire more faculty members but with the increasing need for marine research, the ESC is currently recruiting new faculty members. The expansion of the Biological and Environmental Science Department through the current efforts and proposed initiatives, and initiation of a postgraduate program will lead eventually to hiring a cluster of faculty members in this important field. Future appointments should be in the fields of chemical oceanography, geological/geochemical oceanography, physical oceanography and marine natural products. Moreover, to fulfill the increasing demand of lab services for the new postgraduate programs, the Department of Biological and Environmental Sciences is in need of a chemical oceanography lab that includes instruments essential for water analysis and a core marine biology lab.

Research in marine resources is essential for sustainable development of the country. It will document the natural components of the Qatari ecosystem, protect them from pollution and mitigate its impact in a growing fragile environment. Examples of research in this field include biodiversity ( and and molecular biodiversity (DNA barcoding), impact of extreme conditions and global warming on the function and structure of biotic components, marine ecotoxicology, emerging contaminants, physical-biological coupling and marine drug discovery and the Law of Sea Convention of 1982.

It is evident that a shortage of marine scientists and inadequate awareness regarding protection of marine resources in the long-term will develop into a major problem for Qatar. Hence, it is necessary to reinvigorate the marine sciences program, strengthen it to match the country's needs and create a platform that enhances learning and training. In this regard, reinitiating the B.Sc. program in marine science (CAS) as well as starting M.Sc. and Ph.D. programs in marine science (CAS) will be valuable. The main stakeholders of marine sciences are Ministry of Environment, United Nations Environment Program (UNEP), UN Water and ExxonMobil Research Qatar.

Given the huge past investment in this discipline, the location of Qatar on the Arabian Gulf, the vast sea-coast of the nation (85% of national border), and other reasons mentioned above, the study of marine resources is another field in which Qatar University must take regional lead. Most of the needed investment in the current proposal is in hiring a critical mass of scientists in the different fields of the sub-theme. Additional support for this research program can be sought from local partners like companies working in the energy and environment sector.



## 1.4 Water, Air and Food Security

### 1.4.1 Water

Water is a vital commodity in Qatar like in other arid climate countries of the Middle East. Depletion of groundwater and sea incursion of the coastal areas coupled with scarce rainfall forced the country to depend on desalination as the major source for domestic, industrial and partial agricultural usage. Given the expected rise of water consumption due to population increase and the demand for water for the agricultural aspect of the food security program, expanding/strengthening a program that formulates and implements strategies for water management is essential. Current research at Qatar University on this sub-theme focuses on finding advanced approaches to reduce water consumption through innovative technologies, improving the desalination plant efficiency, and developing better methods for treatment and utilization of sewage water. Research in this area is inherently interdisciplinary, and is closely connected with research in food security, soil sciences, water management and economics. It is expected that future research in this sub-theme will include harvesting rainwater through local dams and subsequently injecting it into the already depleted groundwater aquifers, and charging these aquifers with treated sewage water.

Presently, research in the area of water at QU is still at its early stages. Unambiguously, it needs considerable strengthening if the University desires to be a key player in this domain of research that is strategically important not just for Qatar, but the entire Gulf region, particularly in the light of increasing urbanization. There are around eight faculty members conducting research in the field of water at QU, supported by considerable facilities that include the CAM facilities, the water characterization lab (ESC), chemistry labs at the Central Laboratories Unit (CLU), labs of the Chemical and Civil Engineering departments at CENG, hydraulics lab at the Department of Civil and Architectural Engineering and a pilot membrane desalination plant for research at the Chemical Engineering Department. The current research in water at QU can further benefit from graduate programs in Environmental Science and Engineering by channeling the students to conduct research in this discipline, and by inducting new students through other interdisciplinary avenues. Research in the water sub-theme is currently being conducted by faculty members and researchers at the College of Arts and Sciences, College of Engineering, and the Environmental Studies Center.

Considering the acute and large-scale need for water in Qatar and adjoining countries, the critical mass of scientists conducting research on water and water needs at QU is rather small. Hence, recruiting faculty members at various levels such that a functional interactive group is established is one of the primary needs. It is recommended that future appointments should seek research faculty members in the fields of hydraulics, groundwater, environmental engineering (water) and industrial water treatment. Further, there is a need for a large pilot desalination plant to meet industry requirements. In addition, it is vital that the University establishes/strengthens research in the areas of desalination, treating and recycling sewage and industrial water, water conservation, water management and preserving groundwater resources. These areas have a direct relevance with the sustenance and welfare of the community and are in alignment with the national strategy of the country and the University.

The strengthening of the water research program will allow the establishment of a new graduate program in chemical engineering that will support such research program by producing high-quality next generation scientists locally, which in turn will fulfill the needs of the country and the region. Key stakeholders of this program include the Ministry of Environment, Qatar General Electricity & Water Corporation (Kahramaa), Qatar National Food Security Program, United Nations Environment Program (UNEP), UN Water, and Qatar Electricity & Water Corporation (QEWAC).

Strengthening a consolidated program that focuses on various aspects of research in the area of water at QU will be an investment that will address one of the most important future needs of the country and the region, and will allow the university to play a leading role in any partnership that will formulate future strategies in this area.

### 1.4.2 Air

Air quality is one of the key priorities included in the Qatar National Development Strategy 2011–2016. The strategy explicitly states: “Under the government’s strategy, ozone levels would be controlled to eliminate any periods of excessive levels. The government is also committed to regulating volatile organic compounds”. It also mentions: “High prevalence of asthma and other respiratory diseases is believed to be caused or exacerbated by these pollutants. A recent finding that almost a fifth of Qatari school children suffer from asthma is a serious concern”. The area is thus of vital health significance to the country and therefore deserves serious attention by QU as an area where infrastructure/facilities and critical expertise is created to monitor not just the quality of air but also to study its impact on the population, particularly the younger generation so that appropriate preventative and treatment options could be formulated. In addition to that, there is a need to find ways to mitigate and reduce dust storms, which are prevalent for long periods of the year. These measures include sand dunes fixation, establishment of green belts and other measures.

Research in air quality and pollution is still at its infancy in Qatar. There are around five faculty members doing research, in part, in air quality. The ESC has two air pointers, and a faculty member specialized in the subject. There are some faculty members conducting research in air quality, pollution and indoor air quality with relevant portable equipment at the College of Engineering (CENG) and the College of Arts and Sciences.

It is imperative that the University focuses on this research sub-theme that is highly pertinent to Qatar. The subject is not a regular part of the curriculum in the University (except as an elective course in the master program of Environmental Science), despite its national and global significance. Research in this area in QU will bring awareness among the student community about the importance of clean air and its impact on health. In the light of this, there is a critical need to appoint a group leader level research faculty member in air quality and

pollution who can develop a team around this theme. In terms of infrastructure, there is a need for a central state-of-the-art lab for measuring a broad range of air pollutants, several remote air quality measurement units at several locations in Doha, and a modelling and simulation lab for data analysis. Such infrastructure and resources will strongly encourage students of the master programs in environmental science and engineering to engage in studies related to air quality and pollution modelling, and carry the message about it back to the community.

The Supreme Council of Health and the oil and gas companies are key partners for such research. Both Total and ExxonMobil have some data collection and research facilities in the area. Other stakeholders include the Ministry of Environment, Qatar General Electricity & Water Corporation (Kahramaa), and Qatar Electricity and Water Corporation (QEWAC).



### 1.4.3 Food Security

The recently developed master plan for food security in Qatar envisions an increase in domestic food production from 10 percent of consumption to about 40 percent during the next few years. Such an increase is critical for self-dependence and long-term sustainability for food within the country, and also to align with the needs of a potential increase in local population. However, lack of agricultural water and arable land pose major constraints in achieving this goal. To overcome this, Qatar will shift most of the domestic production of perishable fruits and vegetables from current limited open field production system to a protected agriculture system, especially in greenhouses, that require less water and land area. However, most greenhouses presently used in Qatar are prototypes suitable for cold European climate. These units are designed to retain as much heat as possible, making their cooling systems inefficient for local conditions. Moreover, agricultural production in Qatar is limited by lack of technology, limited information on their cost-benefits, and an inefficient subsidy scheme. Hence strengthening food security is an important step towards advancing the nation in this area, making it a regional leader and global contributor, and ensuring sustained growth in agriculture for future self-dependence. A multidisciplinary approach is expected for this work.

Presently, around 8 faculty members are engaged in research under this sub-theme supported by excellent experimental and analytical capabilities including facilities at the Human Nutrition Lab (CAS), the Sustainable Development Center (CAS), the Water Characterization Lab (ESC), the Environmental Science Program (CAS), QU Farm and the facilities of the Departments of Chemical and Civil & Architectural Engineering at CENG. Enhancing these facilities with careful consideration of the objectives will allow positioning QU and Qatar to becoming the regional leader in food security expertise as well as efficient food production.

For ensuring growth and expansion of research in food security, additional critical mass of expertise will be needed in the areas of food science, agricultural science, agricultural engineering and agricultural food & resource economics. Additionally, establishing a research Center for Agriculture and Food Security should be conscientiously considered in close alignment with similar developments/initiatives in the region. Such a program and/or center will serve as an educational and knowledge

hub for future graduates (MSc & PhD) as well as regional communities. Additionally, it will lead to establishing a major in agricultural science and extension, which is also a current need for the nation. Examples of multidisciplinary research within the food security sub-theme include the development and testing of agricultural technologies, evaluation of their cost-benefits, and the development of an efficient agricultural subsidy scheme as well as in analysis of the WTO rules on trade and sanitary and phyto-sanitary rules, bio-safety and transfer of biotechnology and intellectual property. The major QU units anticipated to interact within this subtheme are College of Arts and Sciences, Engineering, Business, and the Environmental Studies Center.

The main stakeholders are Ministry of Environment, Ministry of Municipality Affairs and Agriculture/Department of Agricultural Affairs, Ministry of Economy and Commerce, Technical Committee for Food Security, Food and Agriculture Organization (FAO), International Center for Agricultural Research in Dry Areas (ICARDA), United Nations Environment Program (UNEP), and Hassad Food.

Improving agricultural practices under arid climatic conditions is a priority for the Gulf/Middle East region. The available expertise, resources and infrastructure at QU provide a sound base for launching an innovative research program in protected agriculture with minimal water waste that promotes food security.

Such research will eventually lead to the gradual improvement of agricultural practice in the whole region. By investing in it in a timely and premeditated manner, Qatar will grow its expertise in this field and will be able to play a leadership role as a model nation for food production in such agro-climatic conditions.







## Theme 2: Social Change & Identity

Modernization brings severe societal changes and affects the whole community. Keeping a fair balance between what is new and what is old is a serious challenge for planners and decision makers in developing countries. Research can help understand such challenges and mitigate the deep impact of modernization. Globalization is an open unprecedented movement of ideals, values, life styles, goods and individuals. In this moving space, the culturally, economically or politically weak are vulnerable. Therefore, positive and effective behavior within this open space requires a rehabilitating movement, and a living understanding of identity that moves it from sheer reaction to action and interaction.

Qatari society currently witnesses a rapid modernizing dynamism and receives a flow of technical products of globalization. Accompanying such flow are accelerating effects on social relations and cultural values that increase potential threats if they were not well studied in a way that helps delineate illuminated policies to tackle them.

Globalization has forcible impact. It forays all homes without knocking at the door. It is a mix of opportunities and challenges for individuals, communities and states. We do not mitigate the impact of globalization; rather, we enhance our ability to seize its opportunities by broadening our free will dealing with all its aspects. This will be done by acquiring cognitive and critical knowledge of its conscious and subconscious impact on all levels of society.

Research on the issues of identity and social change become even more important to Qatar if we take into consideration the population makeup of the country. Qataris form between 12% and 18% of the total population. Therefore, it is vital that we keep track of the impact of the changes that are taking place in the society and the mechanism involved.

The small proportion of the indigenous population has put more demand for national human resources; and hence the greater demand for capacity building. Of course education in this context is essential and that is why the leaders of Qatar have emphasised the role and importance of education as a resource for the individual and for the country in the most emphatic manner in recent years.

## Theme 2: Social Change & Identity *Continued*

Qatar University is best placed to tackle this issue for a simple reason. It is the only higher institute in the country that possesses local knowledge on the subject matter.

In addition, Qatar University has few centers that are directly either working or can work on related matters such as:

- Social and Economic Survey Research Institute (SESRI)
- Center of Humanities and Social Sciences
- Gulf Studies Center
- National Center for Educator Development
- Early Childhood Center
- Sustainable Development Center
- Energy Law and Sustainable Development Center
- Center for Entrepreneurship

However, more collaboration is needed among the various centers. There is a more immediate need for post graduate programs in the related areas.

Currently there are few researches going on in areas related to education or social matters. Many of the faculty in CAS, College of Education and SESRI are working on these topics. However, there is a real need for more focused approach in which the collective effort is geared towards precise goals and objectives as well as a need for longitudinal studies in these fields.

A new emerging sector in Qatar economy is Islamic finance. This may develop into one of the main economic gravity centers not only in Qatar but in the region in the coming years. Islamic economy is the fastest growing economy in world finance; more importantly it is a recognized field of studies in many prestigious universities around the globe such as Oxford, Cambridge, and Stanford etc. Part of the reason is that it has massive resources. There is growing competition among world institutes to take the lead in this regard. This is a real opportunity for Qatar University to take a lead in this in the region.


At the moment little infrastructure is in place to do real research in this field. We suggest starting graduate degree in this field or direct the existing ones in this direction. In addition, there is an urgent need for a dedicated center/research program for this line of research with the entire infrastructure that is needed.

Here are the proposed action plans for the next five years:  
MA/PhD degree in modernization, identity and social matters  
MA/PhD degree in the field of education and capacity building  
MA/PhD degree in the field of renovation of Islamic discourse  
MA/PhD in the field of Islamic finance  
Establish a research program/center in the field of Islamic Finance.  
The size of manpower depends on the scope of the proposed action plans.

It is important to keep in mind that all these disciplines and research areas are interdisciplinary by nature but we need to encourage various researchers from different colleges and research centres to collaborate. This may require more flexible policies at Qatar University level in terms of hiring and time allocated to research.

Due to the local/regional nature of some of the conducted research, it is advisable to launch a biannual refereed journal at QU in the fields of humanities, Islamic studies and educational studies. The organization of an annual scientific conference at QU (every session tackling a research priority) will represent an extra channel through which new scientific research can be disseminated.





## Theme 3: Population, Health & Wellness

### Theme 3: Population, Health & Wellness

#### 3.1 Population, Health & Wellness

Health, wellness and safety of the human population in Qatar are key areas of interest in learning and research at Qatar University. The Qatar Stepwise Report for Chronic Non-Communicable Diseases (NCDs) and Qatar Health annual reports indicates that cancer, cardiovascular diseases, hypertension and diabetes are a major burden and threat to the health of the Qatari community. In Qatar, NCDs cause more than half of the deaths registered per annum and with many more suffering one or more of these diseases. The health burden these diseases cause on the people and government budget has astronomically increased. Consequently, implementing serious measures for decreasing the incidence and prevalence of such chronic diseases and the related mortality in the Qatari population by implementing several evidence-based lifestyle and fiscal interventions is essential.

Cardiovascular research is well established at different local entities such as Qatar University, Qatar Biomedical Research Institute, Qatar Cardiovascular Research Center and Weill Cornell Medical College. However, obesity research has not been given enough attention regardless of its impact on triggering other diseases such as CVDs, cancer and type-2 diabetes. Obesity is increasing among young and adult Qataris and will have a strong impact on the community. In 2012, Qatar STEP survey showed that overweight and obesity affects about 71.8% of Qatari males aged 18-64 years and 68% of Qatari females of the same age group. Both the WHO and the American Medical Association consider obesity a disease. Similarly, cancer is also one of the leading causes of deaths in Qatar and the neighboring countries. Following extensive deliberations among researchers at QU, obesity and cancer were identified as key areas for future research. It was proposed that research be conducted on basic, applied, prevention and clinical aspects. Further, the recommendations were based on i) addressing the most pressing gaps in chronic non-communicable diseases research in Qatar, ii) alignment with Qatar National Vision 2030 and Qatar National Health Strategy 2013-16, iii) potential for multidisciplinary collaboration, iv) QU infrastructural readiness, and v) efficiency of research funding utilization given the overall research activity in Qatar. Other areas of investigation include ethical issues and how Islamic principles support to accommodate the scientific and other trajectories, sport marketing and the impact of sport on Qatar population.

Presently, the University has four potential researchers in the area of cancer and molecular biology. There is a need for a critical mass of mid-high level faculty members (including a couple of clinical track faculty) in the broad areas of cancer and obesity. Additionally, the research must be supported with an education and training component that includes post-docs and research assistants and an administrative coordinator. Infrastructure requirements include a fully-equipped cell culture core lab, microscopy core labs (including confocal microscopy), proteomic/metabolic laboratory, histopathology lab including imaging system, software (tracking cell movement, etc.), physiology lab, pharmacokinetics lab, supporting core facility and stem cell core lab. The program envisions establishing a high-level graduate studies program in metabolic basis for disease and cancer. The main stakeholders include Supreme Council for Health (SCH), Hamad Medical Corporation (HMC) Cancer Hospital, Primary Health Care Corporation (PHCC), Sidra Medical and Research Center, Qatar Biobank, Qatar Biomedical Research Institute, etc.

Caring about the community is a top research priority of Qatar University as adequate emphasis on the well-being of humans is the cornerstone of any real development. Hence, establishing an educated, healthy and well-informed community is the eventual goal because of research outlined in this proposal. Furthermore, it complements the teaching efforts and community services of the University.

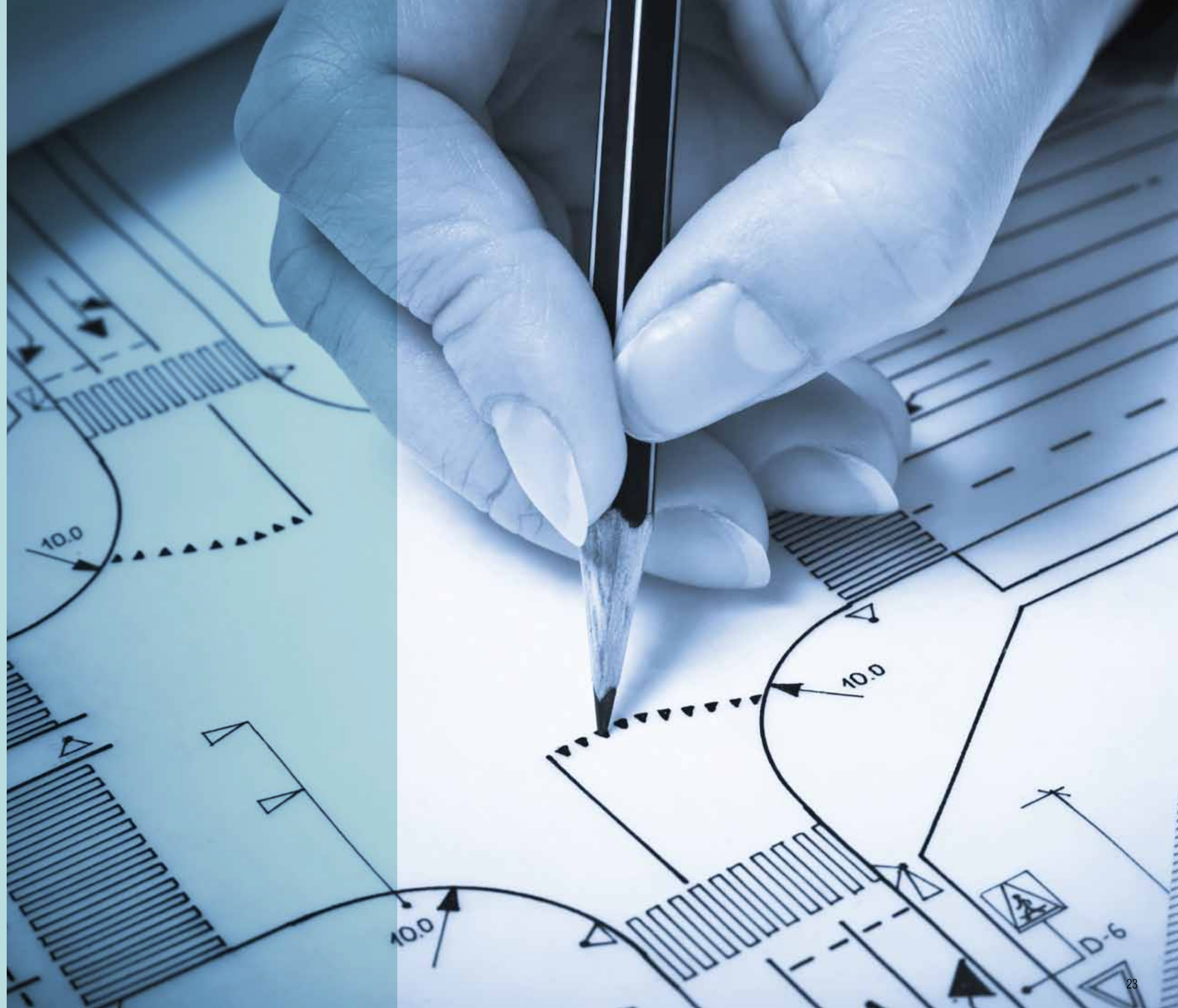
### 3.2 Traffic Safety

Qatar has recognized the need to address traffic safety issues. Therefore in 2008, the National Committee for Traffic Safety (NTSC) was launched. The committee is chaired by His Excellency Sheikh Abdullah bin Nasser Al Thani, Prime Minister and Minister of Interior, and includes members from different institutions in the country. In 2013, NTSC launched its "National Traffic Safety Strategy" to reduce fatalities and injuries on the roads. The strategy has been described as "road map for a safe road transport system" by Qatar's traffic safety officials. This strategy provides a 5-year road map with 200 action plans for reducing road trauma and the human suffering inflicted by road traffic crashes, and represents the first step towards achieving the ambitious vision outlined in the Qatar Road Safety Strategy 2013-2022.

The QU strategy in the sub-theme area of traffic safety will be in line with National Traffic Safety Strategy and will address and translate the highlighted 200 action plans into a series of practical research problems that aim to understand, investigate, improve and raise road safety performance in Qatar. Recognizing the importance and urgency of traffic safety, Qatar University has recently established a new research center, the Qatar Road Safety Studies Center to deal with these issues. There are four researchers in this sub-theme but there is a need to have more faculty members or researchers in the areas of traffic safety, road engineering, road user behavioral change, vehicle safety and biomechanics as well as health and safety at work. To provide beneficial research in this vital domain there is a need for research labs including Seat Restraint Testing facility for occupant safety (space, pneumatic and fully automated sled impact system, high speed camera and other supporting accessories), component testing for vehicle and pedestrian safety, Drop Tower Impact facility for crash energy absorption studies, and also computer software such as VISUM. It is expected that future research will cover areas like traffic analysis, active crash violence and injury mitigation mechanism as well as business analytics and big data analysis.

Potential stakeholders include Qatar National Traffic Safety Committee (NTSC), Hamad Medical Corporation (HMC), Traffic Department/Ministry of Interior, Public Works Authority (Ashghal), Ministry of Municipality and Urban Planning, oil and gas companies, transportation companies and construction companies.

In March 2014, it was announced that the Qatar Road Safety Studies Center (QRSSC) at Qatar University (QU) would receive a contribution of QR1 million from ExxonMobil Qatar to support its efforts in raising awareness of road safety and accident prevention.





## Theme 4: Information, Communication & Technologies (ICT)

### Theme 4: Information and Communication Technologies (ICT)

Information and communication technologies are essential pillars of today's society. Digital technology is constantly transforming our civilization with radical advancements. Qatar University invests heavily in these fields and has a critical mass of scientists doing research in various fields related to this theme. The field of ICT encompasses a wide range of areas and topics. It is a highly interdisciplinary field with applications in almost all disciplines at QU. There are around 60 researchers at Qatar University from different colleges and disciplines engaged in ICT-related research topics.

Advancing this subtheme requires highly experienced and dedicated faculty with a proven track record in various related disciplines, and who can cultivate and steer research projects in collaboration with faculty, students, external collaborators, and stakeholders. Therefore, for each of the three ICT subtheme areas, there is a need for a dedicated senior research faculty member who would be affiliated typically with one of the research centers. This senior researcher is expected to create and manage large-scale extramurally funded projects. Furthermore, an interdisciplinary undertaking of this magnitude will require the active support of a junior faculty member as well as a full-time research assistant working in each of the subtheme areas. We anticipate that additional support will come from existing QU faculty, students, and other research personnel hired through externally funded projects.

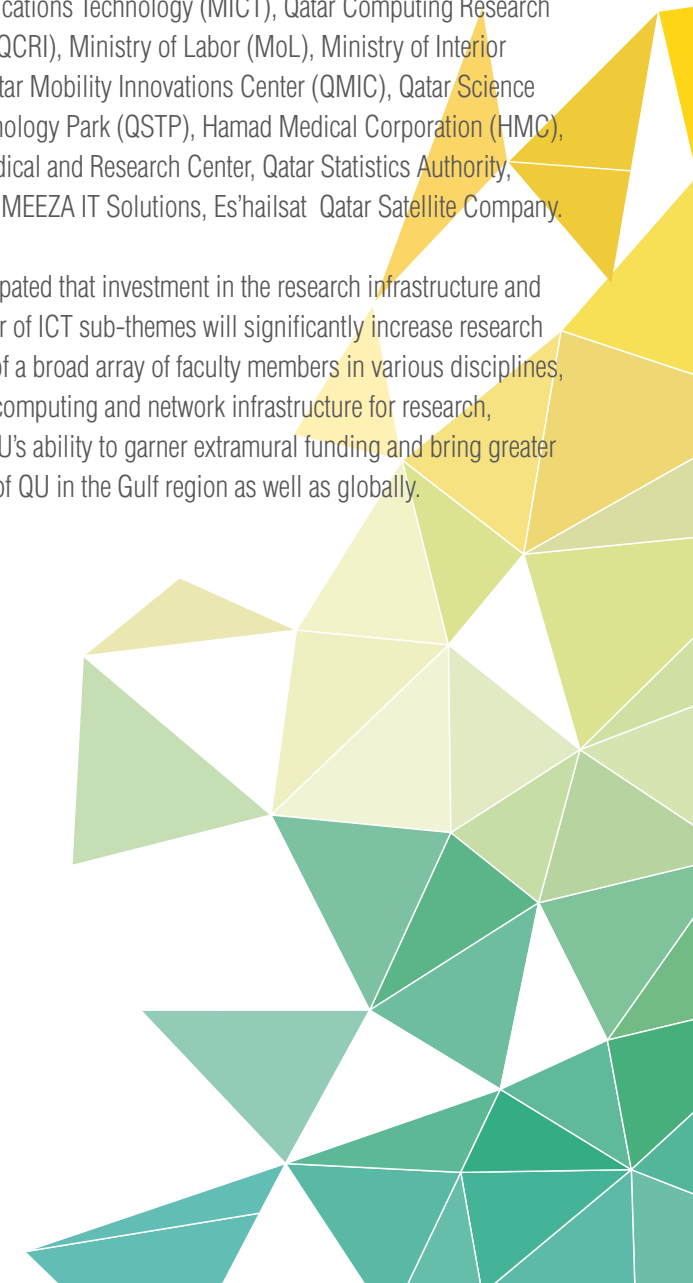
Next, each ICT subtheme area will require a physical research laboratory that maintains essential equipment to support relevant research and educational activities. Therefore, a lab engineer/technician will be needed to install and maintain the laboratory and its equipment and to support their utilization by researchers and students. Two key considerations were recommended by the ICT committee to ensure future impact of proposed work: i) align the hiring of new faculty (e.g. at the Department of Computer Science and Engineering) with the subtheme areas by focusing on recruitment in these areas, and ii) promote faculty involvement in the subtheme areas by providing release time from teaching for conducting research. We anticipate the need for 2 FTE that are allocated (with the approval of colleges) on a semester-by-semester basis.

QU is in the process of building an excellent high-speed research network (Qatar REN-effort is underway by ITS) and IT infrastructure in terms of storage, computer cluster and high-performance computing cloud (this effort is underway by KINDI). There is a

need to establish a research lab for each of the subthemes with the appropriate human support. Research topics in the sub-theme "Intelligent and secure information processing" include cyber security and data business analytics and visualization. In the "Distributed systems and e-Services" sub-theme, the main research topics are cloud computing and mobile sensor network and applications, while in the 'enabling technologies' subtheme research topics include health- and bio-informatics and assistive and educational technology. We envision that research expansion will stimulate establishment of a graduate program with emphasis on health and bio-informatics and a QU funded Ph.D. program for scholarships in the major ICT theme areas.

Major ICT stakeholders include Qatar's National Center for Information Security (Q-CERT), Ministry of Information and Communications Technology (MICT), Qatar Computing Research Institute (QCRI), Ministry of Labor (MoL), Ministry of Interior (MoI), Qatar Mobility Innovations Center (QMIC), Qatar Science and Technology Park (QSTP), Hamad Medical Corporation (HMC), Sidra Medical and Research Center, Qatar Statistics Authority, Ooredoo, MEEZA IT Solutions, Es'hailsat Qatar Satellite Company.

It is anticipated that investment in the research infrastructure and manpower of ICT sub-themes will significantly increase research capacity of a broad array of faculty members in various disciplines, enhance computing and network infrastructure for research, expand QU's ability to garner extramural funding and bring greater visibility of QU in the Gulf region as well as globally.



# Conclusions & recommendations

**1.** The University has a fairly developed infrastructure and a range of expertise in most of the listed research priority themes. However, whether or not we become regional or world leader in any of them requires critical self-assessment. There is no doubt though that we have considerable overall potential, and some of the themes are our strengths.

**2.** In some of the priority themes our advanced research and training infrastructure matches the level of expertise of the critical mass of scientists we have, while in others, the balance is skewed one way or the other. Working toward an acceptable balance that ensures high quality research with a slant towards innovation and societal impact is an imminent need for the future. While priority themes outlined herein set the stage for where our research focus will be during coming years, assertive joint efforts will be vital for the required 'leap' that will assure greater visibility of the university.

**3.** It is imminent that strong research groups – i.e., clusters – need to be created in each of the themes such that diverse expertise in each area adds to the overall strength of the program. This needs to be the basis (or at least seriously considered) for all future faculty recruitment; hence it must be carefully planned with a clear view of current strengths and potential gaps.

**4.** Research and graduate education are inherently overlapping domains. Advancement in one inevitably impacts the other. Hence early careful (re)organization of the graduate programs is essential to meet anticipated needs. It is also imperative to align graduate program development with extramural opportunities, particularly through Qatar Foundation.

**5.** The blue-print for advancement in each of the priority themes must be carefully coordinated across colleges, institutes, centers and other research units within the college. This will optimize utilization of strengths, increase interactions between units and forge stronger relationships for competitive extramural funding. Additionally, close alignment with national institutes and similar high caliber bodies within Qatar (and perhaps even regionally) must be carefully considered to i) eliminate duplication of efforts and ii) increase QU interaction with them.

**6.** The four priority themes have 12 sub-themes. QU's resources cannot immediately invest in each of these themes or sub-themes. Several aspects will be considered and careful evaluations will be made on multiple fronts, before resources will be generated and/or allocated in an intelligent and strategic manner. A fair yet highly competitive process will be instated by the VPR Office to ensure that i) desired stimulus is given to deserving programs and ii) return for investment is ensured in 'multiples'. Other key metrics will be included in the process following discussions with administration and constituents. The process will be outlined and rolled out before the end of the spring term 2014. Three of the 12 priority subthemes will be identified and announced by the end of this year and launched in January 2015 as the first phase projects. Additionally, 3 more programs may be considered as potential contenders for the next level support. Support levels for both sets of projects will have to be deliberated.

**7.** The VPR Office will work with the university administration and a broad range of stakeholders to generate base financial support for launching the program and will actively engage in catalyzing future expansion.

**8.** The VPR Office will keep all constituents informed regarding the announcement of the program, the process, the outcome, subsequent implementation and yearly follow-up/progress for milestones and outcomes.

Learn more about research at Qatar University on:  
[www.qu.edu.qa/offices/research](http://www.qu.edu.qa/offices/research)

