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Qatar National Research Strategy 2014





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Qatar Biomedical Research Institute





Background and Context

The Qatar Foundation R&D Enterprise has instigated on a recurring basis an annual forum that brings all the key stakeholders together in order to discuss and move forward the Qatar National Research Strategy (QNRS).

In 2012, a consultation process with the stakeholder community was launched to convert the high level strategy into a more specific set of opportunities and priorities within the context of the R&D portfolio.

In 2013, Qatar Foundation (QF) leadership facilitated a process to identify and more concretely articulate amongst the many priorities which of those could be defined as Grand Challenges facing Qatar. The concept was that this set of challenges would be defined as multi-disciplinary, multi-institutional, and multi-sector partnership opportunities for advancing research and development (R&D) solutions relating to these challenges. Thus this approach to shortlist among many important priorities within the QNRS built upon the earlier work associated with Qatar National Research Strategy 2012 by providing greater focus to the work of the R&D enterprise, ensuring optimal value and impact in furtherance of the Qatar National Vision 2030 goal of creating a diversified, innovative knowledge economy. The result was a process that engaged the community to identify the first set of 12 Grand Challenges (challenges of national importance).

Since the 2013 forum, a set of four Grand Challenges have been selected by the Foundation leadership and assigned to the relevant Qatar Research Institutes to serve as "champions" for coordinating across the stakeholder community. These four Grand Challenges are:

- 1. Develop, Refine, and Adopt Enhanced Desalination/Waste Water Re-use Capabilities (Water Security)
- 2. Develop/Deploy Solar Energy on the Grid (Energy Security)
- 3. Develop security technology to protect the critical cyber infrastructure (Cyber security)
- 4. Develop plans to tackle Cancer, Diabetes & develop personalised medicine (Healthcare)

The purpose of the 2014 QNRS forum was to align the key stakeholders across all sectors of Research and Development for Qatar in support of the approach and draft business plans that the Institutes have developed for each of the Grand Challenges. This would provide a venue to seek the necessary advice and alignment among the community as a critical element in future program planning and in service of making a significant step forward in the delivery of the QNRS over the coming 12 months.



Executive Summary

The QNRS provides a framework for QF R&D's research objectives and helps drive program plans and measures of performance by guiding the decisions to invest in research and development programs that address critical national priorities and progress towards the 2030 vision for Qatar to become a leading centre for research and development excellence and innovation.

In 2013, Her Highness directed that QF focus on the critical R&D priorities that require special attention, what is now called the R&D Grand Challenges. In response, QF R&D engaged many stakeholders to contribute ideas and insights to help identify a small number of such Grand Challenges. The ideas generated from that process encompassed diverse challenges across many sectors, including energy, environment, cyber security, health, urbanization, mobility and road traffic safety, the social dimensions of change in a rapidly developing economy, and human capacity development for R&D. This process resulted in a short list of 12 priorities which were then even further refined by QF leadership to the current set of four Grand Challenges. QF Leadership have emphasized that although the current focus is on these four Grand Challenges, the remaining priorities identified by the community will be addressed at a later stage.

The objectives of the QNRS forum 2014 were to focus on the 4 Grand Challenges, and:

- Seek input from stakeholders on the grand challenges
- Strengthen and deepen relationships and partnerships with stakeholders
- Identify key action items related to the Grand Challenges, and
- Seek alignment behind the plans for each Grand Challenge

The 2014 QNRS forum was held across four days in May 2014. The Research Institutes – Qatar Computing Research Institute (QCRI), Qatar Energy & Environment Research Institute (QEERI) and Qatar Biomedical Research Institute (QBRI) each hosted a day where the Grand Challenges that they are championing were reviewed and discussed with Day 4 being a summary and report out to a wider group of stakeholders. In all, over 200 people attended at least one of the sessions.

The forum was considered a success by those who attended. The stakeholders appreciated the opportunity to contribute to the ongoing dialogue with new relationships established and existing ones strengthened. Many ideas were generated which were captured and will be incorporated into the future business plans for each Grand Challenge, with clear next steps identified and captured. These are laid out in the following pages in the report.

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A number of common themes also emerged that will serve as a useful framework as the plans are further developed and actioned. These included:

- The need to establish a clear business model in areas such as solar and smart grid, water desalination and cancer research
- Greater sharing of information amongst stakeholders creating national data centres where they do not currently exist and enhancing those that have been established
- Enhancing the governance structures for each Grand Challenge including:
 - Clarity of Roles of different Stakeholders
 - Setting up the appropriate committees and advisory boards
 - Coordination at the National Level
 - Have the Research Institutes play a leading role in coordination
- Avoiding duplication of effort and therefore identifying ongoing mechanisms to bring the community of stakeholders together to collaborate more effectively
- More focus on education and raising public awareness through school curriculums, awareness campaigns for all ages, festivals, and national days devoted to different topics etc.
- A greater role for policy making in a number of areas Water Reuse, National Water Strategy, Solar and Renewables, Healthcare to encourage behavioural change
- More funding to encourage participation incentives, subsidies, funding programmes
- Greater involvement of the social science community to ensure this aspect is brought to each Grand Challenge.





معهد قطر لبحوث الحوسبة Qatar Computing Research Institute

Member of Qatar Foundation மு பல்லு வில்லு குற்று



Qatar Computing Research Institute

Qatar is one of the most connected countries in the world. Culturally, economically, politically, socially, scientifically and financially the nation has risen to global prominence because of an infrastructure and communications network that is highly automated. But with this rapid reliance on computing and networking technologies to multiply the nation's capabilities, comes security concerns on an unprecedented scale, which threaten Qatar's national infrastructure. While cyber security is a global concern, Qatar's systems and vulnerabilities are unique given the country's economy, neighbours and operations structure, which thus heightens the need for solutions that are designed to address these local characteristics using local capacity.

To address this concern, Qatar Foundation Research and Development (QF R&D) identified **Cyber Security** as a National Grand Challenge needing a concerted focus and increased levels of coordination with local stakeholders and global collaborators in order to develop and deploy technologies, policies, and educational resources related to cyber security.

The objective of the Cyber Security Grand Challenge is to protect Qatar, its assets and its citizens, against cyber threats by advancing knowledge, readiness, and practices in cyber security.

Qatar Computing Research Institute (QCRI), a principal constituent of QF R&D, is leading the cyber security research initiative together with key collaborators in Qatar. With the everevolving science and technology advancements, cyber security is an ongoing challenge that will never end. Notwithstanding this reality, it is important to the success to prepare and protect Qatar against cyber vulnerabilities through increased levels of basic and applied research that will create the new defensive and offensive technologies and accelerate their introduction to practical use. In this regard, QCRI will be coordinating these research and development efforts with active involvement from the stakeholder community.

Stakeholders involved in this challenge include organizations in government, industry, education, telecommunications, media, transportation, finance, health, utilities, related supply chain activities as well as mega-projects in Qatar.

Understanding QCRI's goals and objectives help place research in Cyber Security in context. QCRI's goals guide its research to ensure that it has impact on people and the society and address the national priorities of Qatar: empowering citizens, making business and enterprise more competitive, and enabling science and engineering.

Though QCRI undertakes research in six distinct areas important to Qatar and the region, the research projects are crossdisciplinary requiring teams to collaborate closely together:



Regarding QNRS 2014 and the Cyber security Grand Challenge the intended outcomes for the forum were:

- To provide information to the community about the progress made on the Cyber Security Grand Challenge (strategy, draft business and implementation plans)
- To seek the perspectives of the relevant stakeholders and to broaden their participation
- To discuss and define key action items to move the Grand Challenge forward

The forum was structured into two parts: during the morning session, QCRI presented the cyber security grand challenge – overview, progress to date, current research underway as well as the implementation plan and business plan. During the second session, stakeholders were invited to share their expertise, concerns and views.

Over 60 participants from a broad pool of stakeholders attended the event, creating opportunities for wide discussion on the challenge. The stakeholder group included representation from government, policy, energy, education, finance, health, transportation, communication, media, infrastructure and megaprojects.

During the opening session, QCRI introduced the motivation for the grand challenge and went through the progress to date. First, there was a presentation of the overall approach to address the challenge, ranging from strategy to the proposal of the National Cyber Security Research Lab (NCSR-L) as a venue to implement all the necessary actions to meet the challenge at the national level. In developing the strategy, QCRI has engaged with key stakeholders following the announcement of cyber security as a grand challenge in mid-2012. Following the strategic overview, QCRI presented the conclusions of the inaugural cyber threats report, which was launched in March 2014 and describes the emerging cyber threats in Qatar and the wider region. These threats lay the foundation for QCRI's initial research priorities and those of the NCSR-L, which include malware analysis, advanced persistent threat identification and industrial control systems security. These priorities have been identified considering the Qatar National Research Strategy as well as the opportunities and the requirements of the local economy and activities.

The morning session concluded with the presentation of the implementation and business plans, which were presented as an initial draft by QCRI, thus providing an opportunity for the stakeholder community to share how they believe the approach outlined should be shaped.

In the afternoon session, the stakeholders were invited to discuss and provide their feedback on the plans, highlight their expertise as well as to present their concerns. This process was facilitated by a sequence of questions that were put ahead to trigger discussion in the areas of interest for strategy development, the activities of the implementation plan and the proposed business plan. Stakeholders were asked to prioritize their concerns over the emerging threats presented, and to consider other threats unique to their industry.





Some organizations have policies in place to counteract against some of the emerging threats as related to denial of service (DDOS), but there is concern about addressing and securing attacks brought on by BYOD (bring your own device). Attacks on critical infrastructure remains a concern for megaprojects and the energy sector especially given the heavy reliance on third parties in the supply chain, as well as privacy and big data as organizations move towards cloud and mobile services. Privacy was identified as an additional cyber security concern for the stakeholders. A number of specific sub-challenges were also identified within each threat and will serve to improve the next steps in the implementation and business plans.

Though many stakeholders have reprioritized its focus on cyber security and have adopted best practices and guidelines to manage cyber security risk, there was discussion about the need for educating the staff about cyber risk, as well as the need for a trained and skilled cyber labor force.

The final session was open to broad discussion for moving the grand challenge forward. It was noted that the Qatar National Research Fund identified Cyber security as the least funded among all of the areas related to the Grand Challenges. Further, there is a need to define the high priority areas, with stakeholder advice, notably:

- Malware and Advanced Persistent Threats (APT's)
- Industrial Control Systems (ICS) security
- Cloud security (emerging)

The need to clarify stakeholder roles and coordination was also raised.

The leadership team of QCRI expressed their thanks and deep appreciation for the participation and active engagement by the stakeholders during the Cyber security Grand Challenge day of the QNRS Forum. In terms of next steps, QCRI plans to:

- 1. Update the Cyber security implementation plan
- **2.** Update the Cyber security business plan
- **3.** Proceed with further assessment work in critical areas
- 4. Meet with QP to discuss the conclusions from the assessments
- **5.** Meet with the Ministry of Interior to discuss the assessment & coordination for the Business & Implementation Plans revision
- **6.** Meet with the educational stakeholders and align on the coordination required for immediate education and outreach activities
- **7.** Meet with The Qatar National Research Fund (QNRF) to review the programmatic funding strategy within the context of Cyber security grant





معهد قطر لبحوث البيئة والطاقة Qatar Environment & Energy Research Institute

مضوفى ورومية قطر Member of Qatar Joundation



Qatar Environment & Energy Research Institute

Qatar Environment and Energy Research Institute (QEERI) was launched in January 2011. Its mission is to establish research and development programs to ensure sustainable development and management of Qatar's energy and natural resources, preserve the quality of life and health of future generations in the country and make Qatar a leader in basic and applied research to support evidence based programmes and policies.

QEERI aims to address core national research priorities in a systemic and integrated manner and has been tasked to serve as "champion" on the two Grand Challenges of Energy & Water Security. The illustrations below outline the specific R&D challenges posed by these two Grand Challenges and the strategic objectives of each:

Water Security Grand Challenge

R&D challenges		Strategic objectives
•	Efficiency of desalination technologies	 Establish Qatar as the hub for energy-efficient and cost- effective desalination and water purification technologies that can meet Qatar's future needs
•	Recharging the aquifer to 1980 levels	 Accelerate rate of improvement of current technologies Develop, validate, and adopt safe and efficient methods for water reuse and recharging the aquifer
	Rational policy for water reuse	 Water reuse in the gas/oil industry Recharging the aquifer
	Increased salinity in the Gulf	 Ensure the continued safety of Qatar's water supply Focused R&D to develop advances in contaminant removal, contaminant disposal, health effects

There are three main "pillars" to the Water Security Grand Challenge:



Detailed presentations were made by QEERI's experts on desalination, water recharge and water reuse during an open forum attended by over 50 individuals from a multitude of stakeholder organisations. Organisations represented included Qatar Electricity & Water Company, QP, various QF educational institutions such as Texas A&M University, Qatar University, Qatar SolarTec, Green Gulf, Kahramaa and others.

Stakeholders were asked:

Considering the plans presented and the knowledge from your own organization:

- **1.** What should be the 3-5 critical areas of focus within the Water Security Grand Challenge?
- **2.** Consider the targets that you heard today which would have the most positive impact for Qatar? Which is the most important from your perspective?
- **3.** How can we support each other in moving efforts regarding the Grand Challenge forward?
 - Consider partnerships, collaborations, information sharing, regular meetings, advisory boards, etc.
 - Are there any specific requests for others in the room?
 - Are there any offers you want to make into the room (e.g. collaboration)?
 - Specifically with regard to desalination, how can we collaborate more to supply more water for aquifer recharge
- **4.** How can we work together to raise public awareness in the area of Water Security?

What we heard in response to Question 1 included the following:

- Developing more awareness of the challenges and progress being made, and establishing a mechanism for collaboration and communication moving forward
- Focus of research and development should be coordinated at the national level, not "isolated" programs at the institutional level
- All relevant stakeholders should share ownership of the plans and progress moving ahead with the Water Security Grand Challenge





- A need for mapping the Gulf with respect to desalination and the environmental impact of salinity in the Gulf
- At all levels of society, government and industry Qatar must improve perceptions, awareness and education of Water Reuse potential
- Investigate the socio-economic, political and culture impact of water re-use
- There is a clear requirement for data verification of the current situation a need exists for a definitive and comprehensive national database on water re-use data
- There is demand for a National Water policy and strategy e.g., water allocation across sectors to ensure overall sustainability
- A need to understand the impacts of desalination

What we heard in response to Questions 2, 3 and 4 included the following:

- Consider establishing an Advisory board to QEERI which meets quarterly to report and exchange information
- Charters are needed for research cooperation and sharing of ideas and resources across organizations in order to build trust and avoid duplication of efforts
- To hold periodic workshops/seminars to share research output across stakeholders
- A curriculum of education at primary and secondary schools for Water Security should be developed there should be incentives (non-financial)
- To raise public awareness and use incentives to change behavior (use "carrot" not "sticks") – media campaigns on water re-use strategy are required
- Stakeholders should own the solutions (technologies) in order to sell to the Gulf region and world
- Country-wide policies are needed for water reuse

- A data center for data and best practices for energy and water manage government, research and industry to collect info from all and organize distribution
- Enhance leak detection technologies (already some in place)
- QNRF funding awards should require cooperation among academia and industrial partners: suggested that QNRF should establish and enforce mechanisms for cooperation
- For Qatar SolarTec to share solutions on desalination and required data with research institutes





There are three main "pillars" to the Energy Security Grand **Challenge:**

quality





Detailed presentations were made by QEERI's experts on the Photovoltaic Research programme, Energy Storage Thrust and the Grid Integration Research programme.

Stakeholders were asked:

Considering the plans presented and the knowledge from your own organization:

- **1.** What should be the 3-5 critical areas of focus within the Energy Security Grand Challenge?
- **2.** Consider the targets that you heard today which would have the most positive impact for Qatar? Which is the most important from your perspective?
- **3.** How can we support each other in moving efforts regarding the Grand Challenge forward?
 - Consider partnerships, collaborations, information sharing, regular meetings, advisory boards, etc.
 - Are there any specific requests for others in the room?
 - Are there any offers you want to make into the room (e.g. collaboration)?
- **4.** How can we work together to raise public awareness in the area of Energy Security?

What we heard in response to Question 1 included the following:

- Qatar needs to be ready to produce 1GW for power generation
- A business model needs to be put in place for solar and smart grid
- Developing the protocols required is key and standardizing how to connect to the grid
- Support the private sector to help households or companies to connect to grid and meet protocols
- A clear policy on incentives is required for example, why should I put solar panels on my house? There is a need for government supported policies like subsidies
- A clear mechanism for adopting renewable energy is required
- A smart grid is required (work has already commenced on this) with a need to phase deployment of smart metering around Qatar

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- There's a need for the full value chain in Qatar Qatar is still buying inverters internationally and this is not sustainable or appropriate
- Reducing the technical and operational risks of utilizing solar energy
- Examine other solar technologies to guarantee solar power into the future
- For Energy storage for new technologies, use raw materials that are available in Qatar (beyond sodium)

What we heard in response to Questions 2, 3 and 4 included the following:

- A national roadmap—both short and longer term-- needs to be designed and established to determine the level and form of progress in water and renewable energy management
- Develop a "marketing" and awareness campaign of this Grand Challenge through curricula in schools; through the media; by holding festivals (e.g. water or energy); through the Qatar Museum of Science
- A clear set of policies, standards and regulations regarding renewables should be assigned to an authority to enforce these country-wide
- A structure needs to be established to allow tariffs and exchange between private and government for renewable energy production (Refer to Germany as an example)
- End users/researchers such as QEERI/academia should share eventual IP and provide access to their facilities (e.g. for students)
- Academia-researchers: Programs should be in place to encourage PhD students to work together under qualified researchers
- Design more joint appointments, joint programs and/or internships (Academia & Industry for tackling this Grand Challenge)QEERI should serve as the facilitator of these discussions and processes:
 - A standing advisory committee of local stakeholders meeting every 2-3 months
 - Relevant government agencies
 - Industrial suppliers
 - End users
 - Industry interested in research results
 - Research partners

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The findings that QEERI have identified from QNRS 2014 are:

Water Security Grand Challenge

- 1. Support for the roadmap with the need to address water leakage
- **2.** Linkages with the permanent water management committee are needed to provide a scientific basis for the national water policy and strategy
- **3.** Opportunities for desalination pilot scale projects will be provided by utilities (e.g., QEWC)
- **4.** Ongoing activities in water recharge by two major stakeholders should form umbrella projects
- **5.** Improve perception, awareness and education for water reuse

Energy Security Grand Challenge

- **1.** Strong roadmaps with great synergies with Qatar technology suppliers
- **2.** QF is committed to help our stakeholders deploy 1 GW. QF/partners will perform R&D and deploy pilot scale projects to ensure successful deployment by stakeholders
- 3. Smart grid and metering pilots are needed to standardize how to connect to the grid
- 4. Mitigate effects of dust, humidity, climatic conditions of GCC
- **5.** Use raw materials (beyond lithium) for energy storage



The QEERI team expressed thanks and deep appreciation to the community for their participation and active engagement during the Water and Energy Security Grand Challenges day of the QNRS Forum. In terms of next steps, QEERI plans to:

- 1. Adjust the structure and elements of the grand challenge projects to ensure shared ownership with stakeholders as appropriate
- 2. Organize individual round table meetings with each of the stakeholder
- **3.** Foster work on energy efficiency
- 4. Establish a clearance house for data and best practices for energy and water
- **5.** Continue to work on joint appointments and Ph.D. programs with HBKU, QU and TAMU
- 6. Establish a framework for effective communication with stakeholders







Qatar Biomedical Research Institute

QBRI is a National Research Institution set up under the umbrella of Qatar Foundation Research and Development. QBRI is committed to establishing centers of excellence and translational research programs in three focused health priority areas (Diabetes, Cancer and Neurological Diseases) as identified in the Qatar National Research Strategy. These centers will enable Qatar to harness the latest advances in science, medicine and technology and recruit the best minds and talents in the world to develop new knowledge and medical advances aimed at addressing the national health priorities and improving the quality and effectiveness of healthcare in Qatar. This will be achieved thorough coordination and building strategic alliances and partnerships with other institutions and stakeholders in Qatar and leading centers of excellence around the world.

With the QBRI structure only recently developed, the healthcare Grand Challenges are not as far advanced as in the other areas (Water, Energy, Cyber Security) and therefore the focus during the forum was slightly different

The objectives of the QBRI focus day were:

1. To engage with the Stakeholder Community

 to present the early progress made so far by QBRI, including how QBRI can support the Health Grand Challenges (Cancer, Diabetes, Genomics and Personalized Medicine)

2. To develop further the elements and approaches to the Grand Challenges

- To identify most impactful yet likely achievable targets in Cancer, Diabetes, and Genomics & Personalized Healthcare
- To seek input and ideas for how we shape the Research Grand Challenges in Cancer, Diabetes and Genomics and Personalized Medicine
- To identify the most impactful yet likely achievable targets in Cancer, Diabetes, and Genomics & Personalized Healthcare as described in the session

3. To seek alignment behind the plans for each Grand Challenge

- To identify the elements of each Grand Challenge and possible roles of each institution and the stakeholders in the development and implementation of the Grand Challenges
- To identify areas of synergy and collaboration between all of the stakeholders and align on ways we can work together
- To agree on a communication and working strategy for the development of the Health Grand Challenges during the coming months



Presentations were used as a basis to stimulate conversation about each of the Health Grand Challenges:

- **1. Professor Alex Knuth,** Chairman of Cancer Services, Hamad Medical Corporation on "Potential Grand Challenges in Cancer"
- **2.** Dr. Lotfi Chouchane, Weill Cornell Medical College Qatar on "Breast Cancer in Qatar and in Arab world: potential research niches"
- **3.** Dr. Shahrad Taheri, Professor of Medicine, Director Clinical Research Core, Weill Cornell Medical College Qatar on "Diabetes in Qatar: Challenges and Opportunities" in collaboration with Dr. Abdul Badi Abou-Samra, Chairman, Department of Medicine, Hamad Medical Corporation and Co-Chair, Qatar National Diabetes Committee
- **4. Dr. Hadi Abderrahim,** Director, Qatar Biobank, "Genomics and Personalised Medicine"

The forum was designed to allow the group conversation that followed to help share the excellent work so far that has been made in the various fields and shape future activities into the emerging Healthcare Grand Challenges. One of the aims of the forum was to gather enough information to allow direction to be set going forward on the focus areas, priorities, resources needed and any other factors that will allow a cohesive plan to be developed and implemented.

With this context in mind, stakeholders were asked for each of the 3 areas (Cancer, Diabetes, Genomics & Personalized medicine) the following questions:

- 1. How might we frame this topic as a Grand Challenge what are the focus areas and critical elements that must be included?
- 2. Please consider this from the perspective of what will be of biggest benefit to the State of Qatar
- **3.** How can we work together and support each other in moving the Grand Challenge forward?



Cancer

What we heard in response to Questions 1 & 2; framing Cancer as a Grand Challenge:

- There was a view that focusing on Breast Cancer as a Grand Challenge may be most effective due to the progress being made in Qatar and thus provide a shorter term opportunity for translational research
- Breast, Colon and bone marrow are the commonest cancers in Qatar epidemiological research on these 3 types of cancer should be conducted as this will contribute to registries
- Consider blood related cancers as well there might be more opportunities for translational research in this area than with breast cancer
- Organising a programme to improve cancer care (needs to be well designed; need training programs)
- Educating the population about cancer and public awareness campaigns are essential
- A survivorship program is important (identify people who have had cancer and would be willing to tell their stories)
- Personalised medicine for therapies
- Consider environmental factors in cancer (i.e. environmental pollution)
- National screening programs are critical (will provide data for more research) especially for young age breast cancer in Qatar and the Middle East
- "Rich pathology" in Qatar lots of patients, biological markers and diagnostics all of which improve the potential for personalized medicine
- Prevention and early detection = comprehensive approach with all dimensions, infrastructure, community reach, education build successful stories





What we heard in response to Questions 3; working together to move this potential Grand Challenge forward:

- More focus on intramural research a "center of excellence" consortium should be established with a Steering committee to manage this business model and plan
- Accountabilities are critical with each institution to take on specific responsibilities and must be held accountable
- Collaboration should not be mistaken for control
- There should be strategic alliances with international partners
- Success depends on holistic and interdisciplinary (not just health but also computing, engineering, etc.) approach
- Consortia should work together to develop joint proposals to overcome silo problem and this should include not only researchers but investment groups (QNRF, etc.) in discussions
- Close coordination with multiple stakeholders allows for a deeper specialisation
- Can Qatar learn from GCC registry experiences?
- There is a need for funding programs/inducements designed to encourage participation
- Would regulatory approvals be required before doing research?
- We recommend a decree stating "need to work together or else"
- Each organization and person needs a clearly defined role to avoid potential duplication and confusion
- We need to agree on how to work together as one team (despite some competition)
- Now as institutions begin to achieve critical mass, it's a good time to talk about collaboration [before it was possible to operate as siloes]
- Work with patients as their input is also valuable
- The Supreme Council of Health is setting up a mechanism for cross-stakeholder collaboration they will organize quarterly meetings of researchers in each area of research

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- The Supreme Council of Health is working on national registry for research-related equipment (to avoid duplication)
- The Supreme Council of Health is working on a national registry of research going on across all institutions and are planning to send surveys to all parties
- There ought to be joint appointments in order to build critical mass quickly
- A flat organization is required in order to enable true collaboration
- The commitment of institutions critical which will be demonstrated by their investing their own resources
- Apply results so medical community can see results more quickly
- We need to find a way of making progress more quickly

Diabetes

What we heard in response to Questions 1 & 2; framing Diabetes as a Grand Challenge:

- Education and Awareness is required from a very early age and this can take place via media, social media, schools; policy making (e.g. holding a "Diabetes Day" annually)
- Prevention glucose monitoring using technologies such as monitoring via cloud;
- Intervention (clinical) clinical trials; therapeutic trials; biomarker studies pharmacogenomics
- Strengthen data acquisition from the registry
- Conduct large epidemiologic studies 1) pre-diabetes specific and 2) diabetes specific
- Conduct clinical trials unique opportunities (personalized medicine can be done here now) one of the few places you can do genomes in a country
- No single institution can address this Grand Challenge on its own
- Policy (there is a need for basic policy to achieve behavioral change)
- Cohort studies, starting with child ages

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- Harness social science component lifestyle changes and risk factors
- Integrated approach, with policy as a driver (for prevention, intervention)

What we heard in response to Questions 3; working together to move this potential Grand Challenge forward:

- There's good alignment regarding the vision however, the challenge is in the logistics of alignment
- Create a grant scheme at the national level make joint grant applications to QF R&D as a multidisciplinary approach. Give greater priority for example in QNRF to applications that incorporate collaborations within Qatar (not just for collaboration with international institutions) and also extra weighting for multidisciplinary approaches
- Create an easily accessible inventory/index of all institutions and assets
- Central services need to be assessed and made available, as appropriate
- Interplay of diabetes and other diseases (e.g., with cancer and cardiovascular diseases)
- Strategic goal of diabetes prevention
- Clinical trials (not specified whether therapeutic or what)
- Involve nutritionists and social scientists in research and especially at the prevention level
- There needs to be a policy for driving behavioural change Qataris need to start as young as possible; the social science component should be harnessed to get into the mind of the individual as early as possible
- We need to do quick research for those who have this disease



Genomics & Personalized Medicine

What we heard in response to Questions 1 & 2; framing Genomics & Personalized Medicine as a Grand Challenge:

- A single institution needs to lead the effort this process is already underway for genomics in particular
- A Database / repository of data is available already (e.g., genomic data) centralized, password protected but accessible to entire R&D community
- Genomic sequencing needs to take place focusing on cancer and diabetes
- Build capacity need to educate professionals in many different institutions
- Develop computer algorithms for diagnostic markers, predictive conclusions, eventually therapeutics which will lead to a personalized medicine concept
- Will lead to personalised medicine in Qatar (somewhat homogenous population, a high percentage of consanguinity, large family size) which will be a unique value proposition to achieve a knowledge based economy
- A challenge to potential success will be communication and collaboration across institutions & sectors
- Consider doing pharmacogenomics using whole genome testing for drug sensitivity, testing
- Genomic sequencing and 'omics important, but also need clinical infrastructure (to translate into personalized medicine)

What we heard in response to Questions 3; working together to move this potential Grand Challenge forward:

- "Money is a great integrator" but might not be sufficient in Qatar
- We need to build the human and physical infrastructure at the same time
- Use what's on the ground already to push the vision forward
- Training is critical R&D may take longer in Qatar compared to established R&D ecosystems, because need to build the talent pool at the same time



- Accountability (peer pressure) is important each institution tasked with responsibility must follow through or be kicked out of the effort
- Biobank Qatar and Genome Qatar provide exciting opportunities but need to clarify relationship – for example, who constitutes the proposed 60,000 Biobank cohort (is it Qatari and non-Qataris?)
- Institutions are interested in the consortium/project balance between "in house", what can be centralized, how bioinformatics will be handled ... each institution needs to maintain expertise in house, but bioinformatics perhaps better as a centralized facility/function ... balance is that institutions can help interpret data
- Priorities of stakeholders: who will determine priorities, given that different ones will see things from different angles, have different views/priorities Especially with regard to validation e.g., if need more DNA to validate, will it be available?

The team of QBRI expressed thanks and deep appreciation for the active community participation and active engagement during the Health Grand Challenges day of the QNRS Forum. In terms of next steps, QBRI plans to:

- 1. Review the constructive feedback received from stakeholders and continue to solicit input from all the stakeholders and the institutions that were not represented in the discussions and/or were not able to participate in the QNRS
- **2.** Complete the analysis of the data provided in the survey form and share the results with all
- **3.** Engage patient advocacy groups and colleagues from the Social Sciences
- 4. Establish a working committee for each Grand Challenge
- **5.** Convene the first joint committee meeting for each Grand Challenge
- **6.** Invite anyone with additional comments or suggestions concerning the Grand Challenges to share their thoughts and ideas with QBRI

END OF REPORT

