Bridging the Energy-Water Gap

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Regional capacity building workshop on "Water - Energy Nexus Operational Toolkit: Resource Efficiency",
20th- 21th February 2017, Manama, Bahrain.

The Presentation

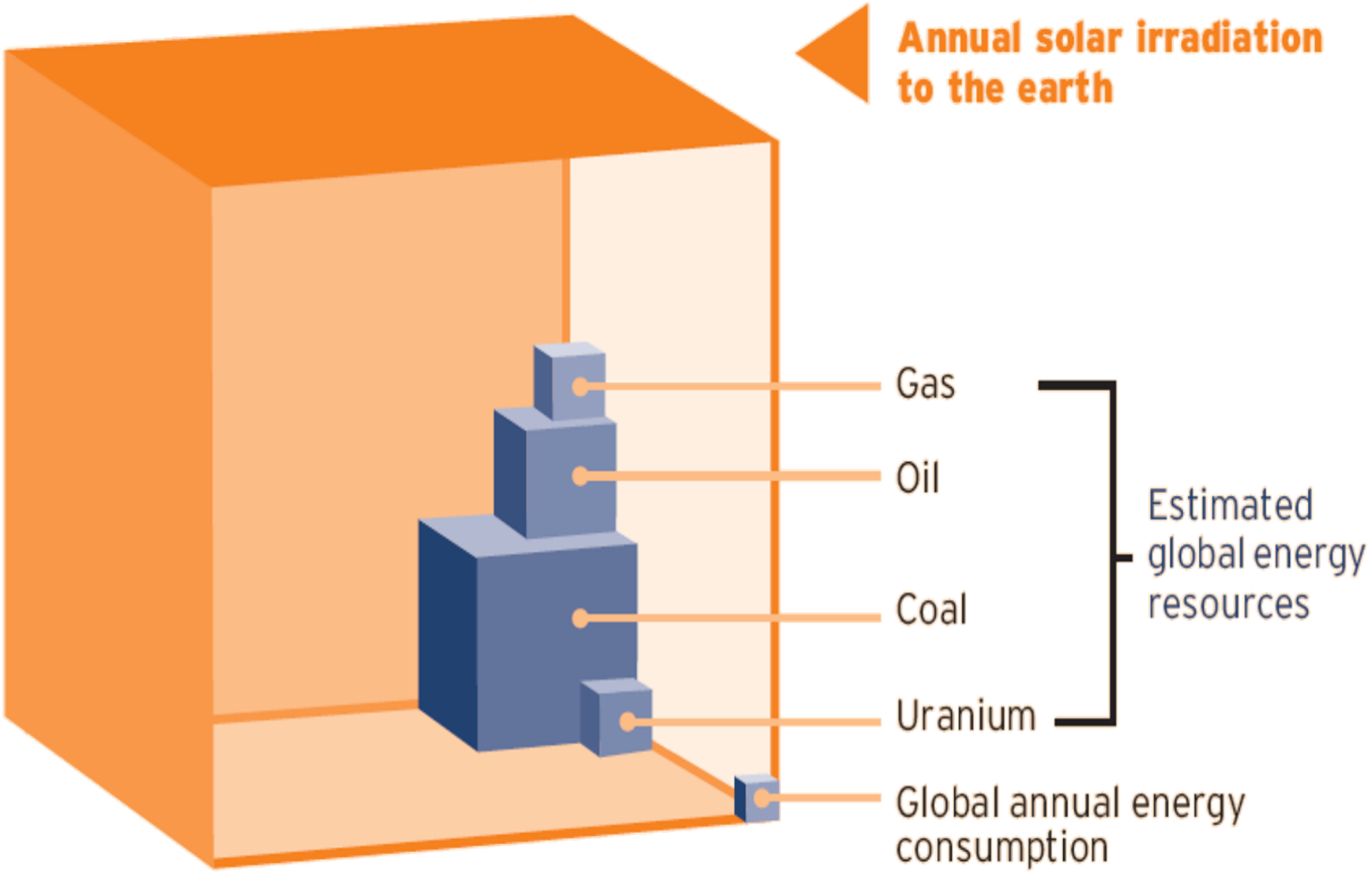
- Energy Challenge
- Energy - Water Connection
- Water in the Gas Industry
- The GCC Case
- The Way Forward
- Conclusions

The Energy Challenge

- By 2050
  - World energy demand is expected to double
  - World population to go from 7 to 9 Billion people.

- Competing factors:
  - Rising demand
  - Depletion of conventional supply stocks
  - Environmental and social effects

ENERGY RESOUCES AVAILABLE



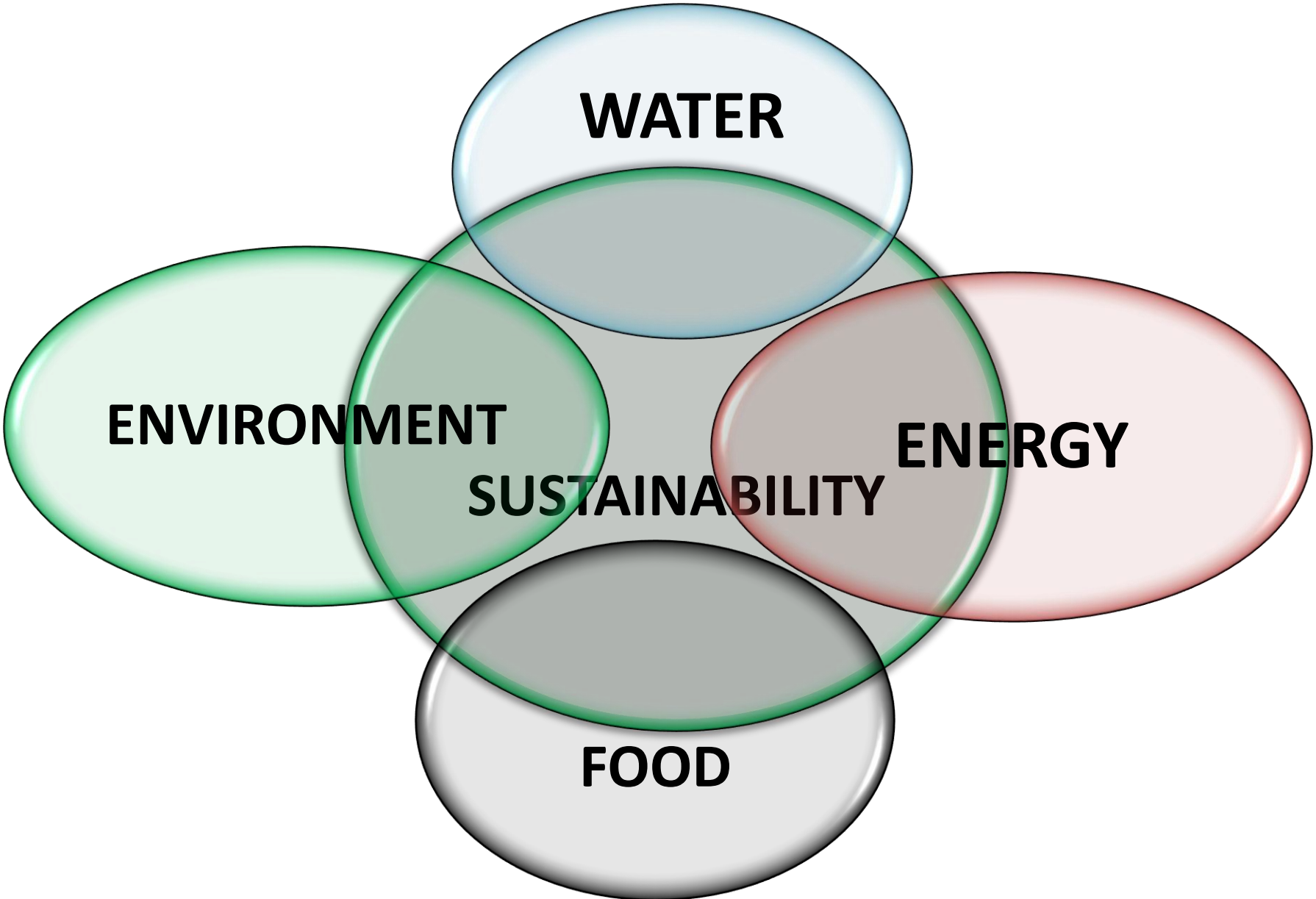
Humanity's Top Ten Problems
Next 50 Years

Richard Smalley, 2003 (1996 Noble Laureate in Chemistry)

1. **ENERGY**
2. **WATER**
3. **FOOD**
4. **ENVIRONMENT**
5. **POVERTY**
6. **TERRORISM & WAR**
7. **DISEASE**
8. **EDUCATION**
9. **DEMOCRACY**
10. **POPULATION**

2003 6.3 Billion People
2050 8-10 Billion People

SUSTAINABILITY



ENERGY DEFICIENCY

In December 2007, energy experts with the International Energy Agency described what it would take to reduce emissions 50 percent by 2050.

This is their presentation.

ENERGY DEFICIENCY

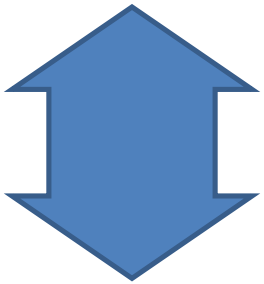
1. 30 new nuclear power plants around the world.
2. 17,000 wind turbines
3. 400 biomass power plants
4. Two hydroelectric dams the size of China's Three Gorges Dam
5. 42 coal or natural gas power plants with carbon capture and storage.

Repeat all of the above every year from 2013 - 2030.

Water & Energy

Water and Energy are interconnected:

Energy is needed to make use of Water



Water is needed to make use of Energy

Water & Energy

The GCC CASE

Oil and Natural Gas are plentiful but natural water is scarce

99% of the freshwater supply comes from desalination

However, the oil/gas industries generate huge amounts of wastewater

Produced Water

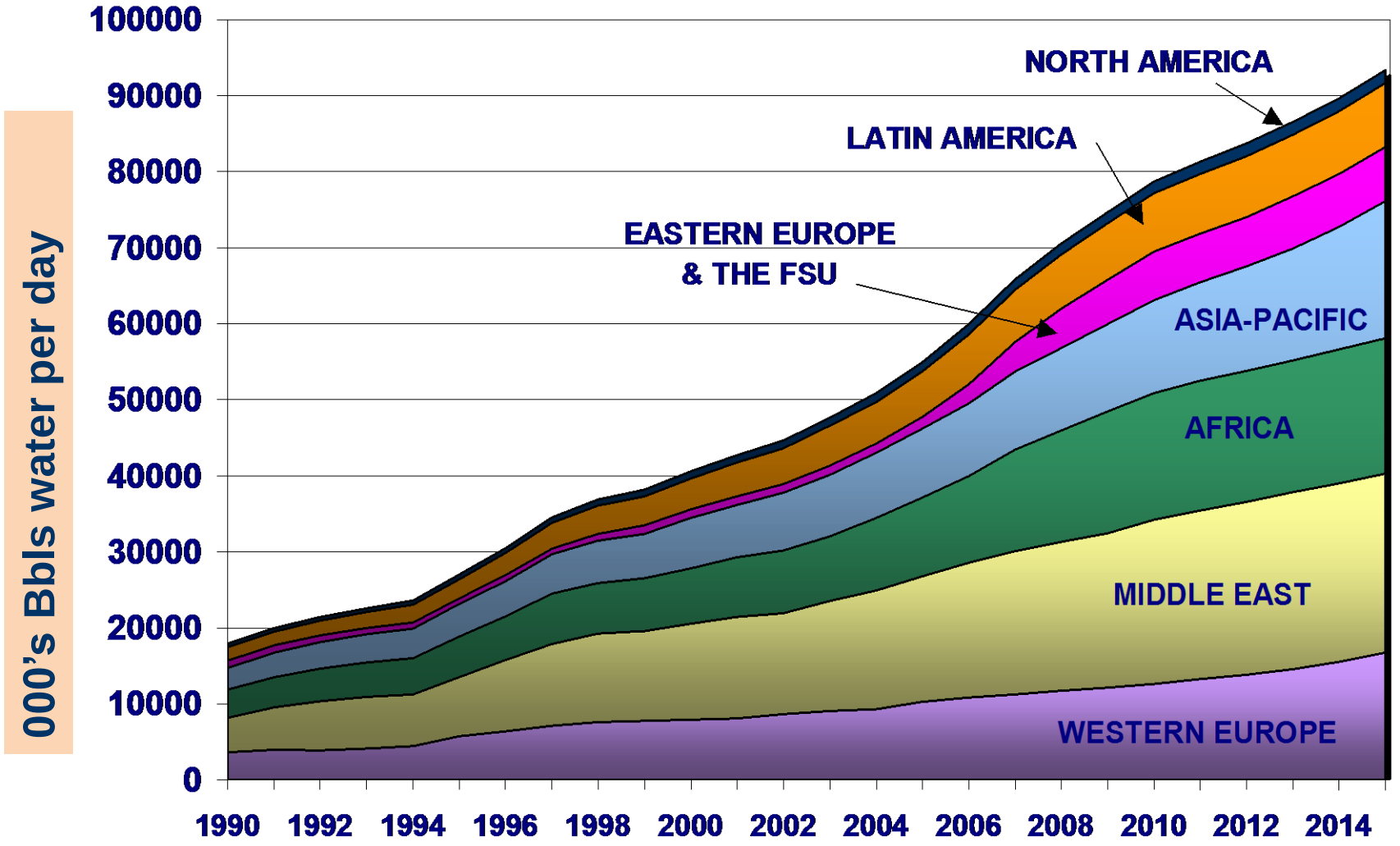
Produced Water (PW) is water found in the same formations as oil and gas. It increases with the age of the well.

It is extracted at the same time and contains chemical characteristics of the reservoir.

Wells are shut when the cost of PW is higher then the profit from the fuel produced.

PRODUCED WATER

Offshore produced water indicates significant growth



PRODUCED WATER

Large quantities of produced water are generated from oil and gas fields. There is a pressing need to deal with the issue:

- **Reduced oil and gas production**
  - **Existing process systems unable to handle increasing water yield**
  - **Produced water displaces potential oil and gas processing capacity**
  - **High water outputs are a key driver of wells being shut.**
- **Environmental**
  - **Increasingly stringent environmental regulations**

PRODUCED WATER

PW constitutes the industry's most important waste stream. Its management include:

- **Reduce PW production through use of blockers or downhole water separators.**
- **Treat and re-inject for enhanced recovery**
- **Treat and discharge**
- **Treat and reuse in operations like drilling**
- **Treat and use in irrigation, animal consumption or even drinking water**

PRODUCED WATER

PW treatment include:

- De-Oiling
- Soluble organics removal
- Disinfection (remove bacteria, algae etc)
- Remove suspended Solids (sand & particles)
- Dissolved gas removal such CO2 and H2S
- Desalination and demineralisation
- Softening
- Sodium Adsorption Ratio (SAR) adjustment by addition of Calcium or Magnesium ions.

OIL/GAS & CONSTRUCTION INDUSTRIES ALLIANCE

There is a natural alliance between these two sectors based on mutually beneficial water management issues.

- **One Produces huge quantities of unwanted water**
- **The other needs large quantities of low grade water to function**

Table (2) Chemical Limitations for Mixing Water

Qatar Construction Specifications QCS 2007 Section 5(4) and Preliminary Approved Modifications.

Parameter	QCS 2007 Test Method	New PRELIMINARY Approved QCS Test Method	QCS Maximum Limit, mg/	New PRELIMINARY Approved QCS Maximum Limit, mg/l
(a) Chloride (as CI) (a-1) for Pre-stressed concrete. (a-2) for reinforced concrete. (a-3) for concrete without reinforcement.	BS 1377 : Part 3	EN 196-2	500	500 1000 4500
(b) Sulfates (as SO_4^{2-})	BS 1377 : Part 3	EN 196-2	1000	2000
(c) Alkali (c-1) Alkali carbonates and bicarbonates (c-2) Alkali equivalent sodium oxides	BS 2690 : Part 109	BS 6068-2.51 BS EN ISO 9963-1 BS EN ISO 9963-2	500	500 1500
(d) Total dissolved ions, including a, b and c above (d-1) for pre-stressed concrete (d-2) reinforced concrete. (d-3) for concrete without reinforcement.	BS 1377 : Part 3	EN 196-2 BS 1377 : Part 3	2000	1000 2000 5000
(e) pH	BS 2690 : Part 5	BS 6068-2.50	7 - 9	6.5 - 9.0
COD		SM 5220 B		100
Phosphate; expressed as PO_4 - P		SM 4500 P B, C, SM 4500 PD by subtraction		30
Nitrate; expressed as NO_3^--N		ISO 7890-1		100
Lead; expressed as Pb^{2+}		SM 3125B (ICP/MS)		100
Zinc; expressed as Zn^{2+}		SM 3125B (ICP/MS)		100

مؤسسة قطر
Qatar Foundation

مجلس قطر للمباني الخضراء
QATAR GREEN BUILDING COUNCIL

TOGETHER LET'S BUILD A SUSTAINABLE FUTURE

WHAT WE DO
VISION & MISSION
LEADERSHIP
QGBC & QNV 2030

VISION

To provide leadership and collaboration for Qatar in guiding and adopting environmentally sustainable practices for green building design and development, support the health and sustainability of our environment, people and economic security for generations to come.

MISSION

To generate and foster awareness , create understanding and to initiate education; develop a definitive set of clear environmental and green building best practice guidelines; and to support and commit to research and development.

"The mission of the Qatar Green Building Council is in complete alignment with the inspiring vision of H.H. the Emir Sheikh Hamad Bin Khalifa Al Thani for the State of Qatar. Driven by this vision and the global

OIL/GAS & CONSTRUCTION INDUSTRIES ALLIANCE

Timofti on his election as the president of the Republic of Moldova. The Heir Apparent His Highness Sheikh Tamim bin Hamad al Thani has sent a similar cable to Moldova's elected president. (QNA)

der them. I want you to make the most of your education, and I want you to make me proud," HH Sheikha Moza added.

The assembly included pupils who were part of QA's first intake, such as Grade 12 student Sheikh Mohammed al Thani. "Growing up in this school ly responded by declaring, "In 2022, I will be playing football for Qatar," followed by another student who exclaimed, "I also want to play for Qatar in 2022, but as team captain." As the assembled group applauded, Sheikha Moza expressed her approval, remarking, "That's what I

"When I show visitors around, I tell them that all of these are just manifestations of the vision of the Emir His Highness Sheikh Hamad bin Khalifa al Thani and Her Highness Sheikha Moza for this nation and for the people from other countries who chose to live here."

eye infection.

"If your eyes become irritated, rinse with water and be especially careful if you wear contact lenses. During hot weather, always carry a supply of water to keep from

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Dust storms
visibility for n
lead to an in
number of inju
road accidents.

Drive to rationalise water use in Qatar soo

LANI ROSE R DIZON
DOHA

QATAR General Electricity & Water Corporation (Kahramaa) is set to launch a national campaign for rationalising the use of water in the country.

Kahramaa President Engineer Essa bin Hilal al Kuwari stated this on Monday at a press meet to announce the 10th Gulf Water Conference which will be hosted in Qatar for the second time from April 22 to 24.

He said the campaign for rational use of water, details of which were yet to be made public, would include specific plans on how the residents could achieve the new Kahramaa target to reduce water use in Qatar.

Kuwari also said that water consumption in Qatar had increased by nine percent this year over the last year. "We are expecting to continue with the same rate for the next two years. The average water consumption per capita in Qatar is around 430 litres per day. On an average, we ensure that there is reserve storage for around three days and our plan is to raise this storage capacity up to seven days," Kuwari added.

Speaking about the conference, he said that the three-day event would focus on coordination and cooperation among the GCC countries in the development of water resources and rationalisation of water usage.

More than 500 delegates, including ministers and concerned officials in the GCC countries, leaders, experts, academics and officials in public and private sectors involved in water, power and food security projects are expected to attend the meet.

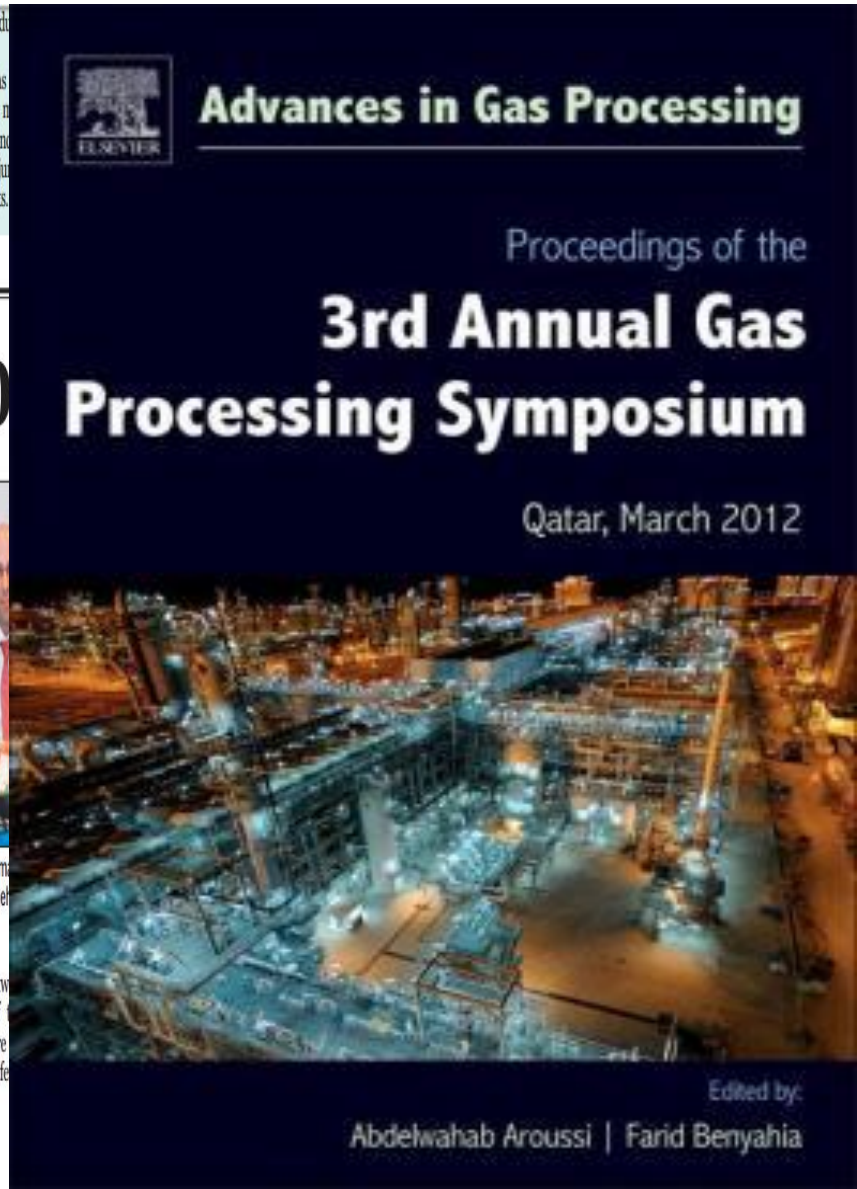
Delegates from the United Nations including ESCWA, UNDP and UNU will also participate in the event.

The event will be held under the patronage of the Minister of Energy and Industry HE Dr Mohammad bin Saleh al Sada and is being organised by Kahramaa, the Water Science and Technology Association and the General Secretariat of the Cooperation Council for the Arab Gulf States in cooperation with the Interactive Business Network (IBN).

Under the theme 'water in the GCC countries – water, energy and food Nexus', the conference would address issues including the present situation as regards planning and managing sustainable water resources in the GCC countries; projections of water requirements in the region and means of reducing the expected gap between water supplies and demand.

Engineer Ali Saif al Malki, chairman of the conference organising committee and director for Kahramaa's Water Networks, Raed Chehaib, CEO of Interactive Business Netw
sentatives of
sponsors were
the press confe

(From left) Director of Kahramaa's Water Networks Engineer Ali Saif al Malki, Kahrama
Engineer Essa bin Hilal al Kuwari and CEO of Interactive Business Network Raed Che
conference, in Doha, on Monday. (HANSON K JOSEPH)



GAS- OTHER INDUTRIES

There are other natural alliances on water issues including

- **Transport**
- **Landscaping**
- **De-dusting**
- **Irrigation**
- **Cooling (Heat exchangers)**

CONCLUSIONS

- **Produced water challenge to the oil and gas industries worldwide is real**
- **Develop strategic alliances between different sectors with complimentary needs, services and products.**
- **The right mix of policies to address both energy and water security as well as climate concern depends on the balance of costs and benefits, which vary among countries.**
- **Many of the policies to alleviate energy insecurity could also help to mitigate climate change**
- **Promote energy efficiency should be priority – not only will contribute to reduce GHG emissions but it will also reduce the investment needs to meet rising demand for energy services.**


THANK YOU