2024

September

The Effect of the Energy Transition on Water Resources

CEO Roundtable White Paper

The Al-Attiyah Foundation

01 OUR MEMBERS

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The third quarterly CEO Roundtable of 2024 commenced with a speech from Vice Chairman of the Board of Trustees of the Al-Attiyah Foundation, His Excellency Ibrahim Ibrahim. During H.E. Ibrahim Ibrahim's address, he extended greetings to members, guests, and speakers gathered in the room and online. H.E. Ibrahim Ibrahim commented that water and energy are the two pillars of existence and that the interactions are complex but an understanding of them was necessary. This complexity is further compounded by the added requirements of the global pursuit for transition to clean energy and the need to move to renewable energy sources. Energy production requires water and water production requires energy, H.E. Ibrahim Ibrahim concluded.

CEO WHITE PAPER

H.E. Abdullah bin Hamad Al-Attiyah created the Foundation as a platform for knowledge exchange and to support the global community in the quest towards a sustainable energy future.

The CEO Roundtable is an opportunity for CEOs, Foundation members and partners to meet in one room and examine pertinent energy and sustainable development topics.

MODERATOR & SPEAKERS

Moderator:

Stephen Cole, International Broadcasting Journalist, Director at Brazil Communications

Speaker

Dr. Mohammed Mahmoud, Water Management and Climate Adaptation Expert

Speaker

Prof. Gary Amy, Dean Distinguished Professor at Clemson University

Speaker

Radia Sedaoui, Chief of Energy at the UN Economic & Social Commission for Western Asia (ESCWA)

Speaker

Dr. Albert Janssen, Principal Advisor Circular Economy at Shell

Speaker

Dr Jenny Lawler, Senior Research Director of the Water Center at the Qatar Environment and Energy Research Institute (QEERI)

Professor Gary L. Amy spoke of the possibilities of "greening the reverse osmosis process". Currently, reverse osmosis has high energy and a high environmental impact. Problems of marine pollution, chemical usage and membrane life exist but are gradually being tackled, he noted. Renewable energy sources are being added to reverse osmosis plants and extracting more value from the process is also possible. More fresh water can be squeezed out of the process, and more valuable minerals can be extracted from the spent brine. Prof. Amy concluded that while reverse osmosis is over 55 years old, progress is still being made on improving its efficiency.

Dr Albert Janssen also highlighted the interrelationship between energy and water by giving some practical examples. Fracking cannot be done without water, solar panels need cleaning with water, stream turbines need water and the production of hydrogen as a clean fuel needs both water and energy. Shell now has a water conversation strategy and has succeeded in reducing water consumption in its activities in water stressed areas by 25%. In closing, Dr Jannsen spoke of IPIECA's work. IPIECA is a "not for profit" organisation that focuses on advancing the oil and gas industry's environmental and social performance and contribution to the energy transition in the context of sustainable development.

Dr Mohammed Mahmoud raised four issues which should be resolved when considering the interrelationship between energy and water. Firstly, the water energy nexus not only impacts desalination, but other water related processes such as wastewater processing, the use of cooling water in industry and the storage and distribution of water. Secondly, in the energy transition process, water is needed for several purposes, including the cleaning solar panels, for pump storage, for concentrated solar energy and for hydropower. Thirdly, climate change

will affect all areas, but extreme heat will be a factor especially in the MENA region. Finally, the demands of industrialisation, urbanisation and population growth will bring with it increased demand for water and energy so that this nexus will become more prominent.

Ms Radia Sedaoui commented on the need of a portfolio approach both for energy production and for water production and usage. She again emphasised that the nexus is a growing concern and that technologies are needed to ensure viable outcomes. As the energy transition proceeds then the usage of water will change and so the transition needs to be manged with respect to water usage as well as energy production. One of the major usages of water worldwide is in agriculture. Here, a well-managed approach is necessary to ensure that water, as a scarce resource is used and conserved appropriately.

Dr Jenny Lawler stressed that water is the enabler of life. Qatar is amongst the most water scarce countries in the world and water is key to its economic development.

Qatar, is at the forefront of technology in tackling the nexus challenges, Dr Lawler noted. Qatar has relied on the cogeneration of electricity and water successfully over the years and it has worked well. However, we must be careful to protect our environment. Coral reefs and mangrove swamps protect our seashore and must be preserved so we need to continually look at brine discharges. Industrial plants must look towards zero discharges and zero emission operations.

The presentations used by two of the speakers (Professor Amy and Dr Janssen) for their opening remarks are shown in Appendix A.

05 MODERATED DISCUSSION

After the guest speakers' presentations, the moderator opened the floor to other participants of the roundtable for comments, questions, and discussion. In the moderated discussion that ensued, the following issues were raised and discussed by the participants:

- There are technologies that can reduce brine discharge to zero but reducing discharge by 90% may be more cost effective.
- Fossil fuel usage can be reduced as the water supply increases but a portfolio of fossil fuel technologies is necessary to make this a possibility.
- International Oil Companies (IOCs) are engaged in water conservation and the reduction of harmful emissions and discharges. There is almost complete use of produced water for diverse range of purposes, mostly for Enhance Oil Recovery (EOC).
- Firewater (water that has been used during firefighting operations) and makeup water (water that is added to plant processes to compensate for losses) are used worldwide for various applications including for water cooling.
- Attendees agreed that the global public should be better educated on the benefits of conserving fresh water.
- Water stressed countries receive direct grants from funding agencies and technology such as low energy water purification methods.

- The 2030 Agenda for Sustainable Development, adopted by all United Nations members in 2015, created 17 world Sustainable Development Goals (SDGs). It was noted that progress on SDG 6, which declares the importance of achieving "clean water and sanitation for all", is very slow and that more is needed on mitigation and adaptation measures, including financial aid.

- For water management, the United Nations' aims and actions are spread over various agencies at various levels. For example, the international resolution of water conflicts and encouragement of regional cooperation and technology transfer are performed by different UN entities.

- Approximately 67% of the world's fresh water goes to agricultural uses. Increased efficiency of use would be a major saving in water use in the agricultural sector.

07 SUMMARY HIGHLIGHTS OF THE ROUNDTABLE

- Experts should look at water holistically and determine which types can be used best for its various purposes.
- Better reporting and transparency of use will aid water conservation measures and lead to water savings.
- The water nexus also involves water security and energy security.
- The disconnect between the energy-water nexus needs closer examination. Disconnects need to be addressed, particularly with regards to Nationally Determined Contributions (NDC).

In wrapping up the discussion, Stephen Cole expressed his appreciation to both the speakers and participants for their insightful contributions. He highlighted the importance of viewing water holistically to ensure optimal usage across various sectors and the need for improved transparency in water usage reporting, which can drive significant conservation efforts.

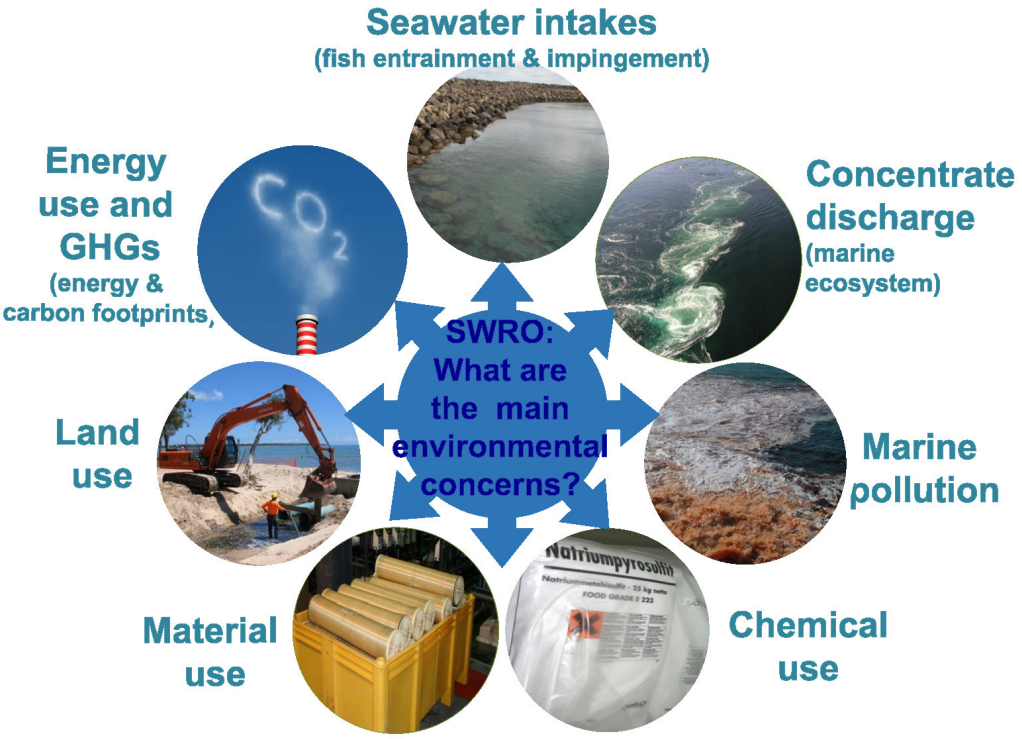
In his closing address, H.E. Ibrahim Ibrahim also conveyed his deep gratitude to the Foundation's esteemed member companies for their unwavering support and invaluable contributions. Their commitment plays a pivotal role in advancing the Foundation's mission and fostering meaningful dialogue on critical issues such as the energy-water nexus, water security, and energy security, H.E. Ibrahim Ibrahim noted.

By addressing the disconnects within the energy-water nexus, particularly in relation to Nationally Determined Contributions (NDCs), the path toward sustainable solutions becomes clearer, ultimately benefiting both the environment and global communities.

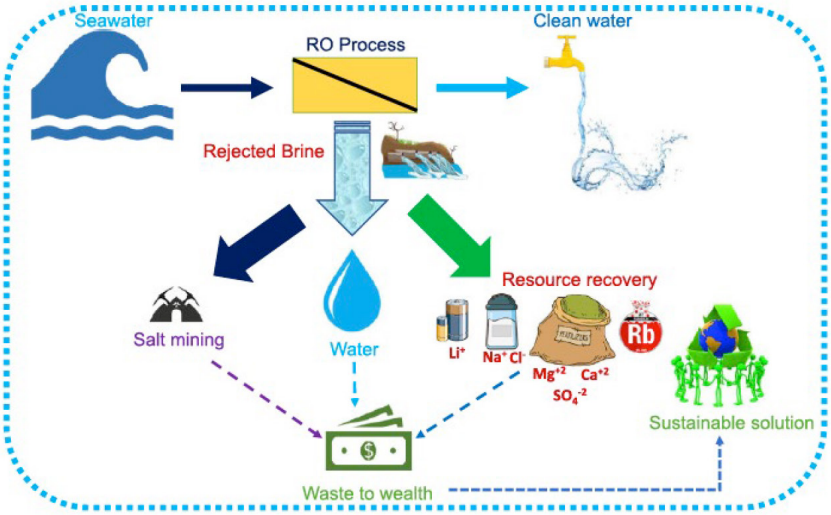
Prof. Gary Amy Clemson University USA

The *Greening* of Seawater Reverse Osmosis (SWRO)

Prof. Gary Amy
Clemson University USA



Seawater RO Brine *Mining* *(Desalination 543 (2022) 116093)*



Valorization of Brine

NEOM in Saudi Arabia

- High-Recovery Seawater Desalination
- Coupled with Zero Liquid Discharge (ZLD)
- Increased Water Recovery
- Reduction in Intake & Outfall Requirements
- Planned Recovery of Sodium Chloride, Potassium Chloride, Magnesium Oxide, Calcium Carbonate, Gypsum, Bromine, Chlorine, Lithium Carbonate, Rubidium

Dr. Albert Janssen, Principal Circular Economy Lead

Definitions & cautionary note

Cautionary Note

The companies in which Shell plc directly and indirectly owns investments are separate legal entities. In this presentation "Shell", "Shell Group" and "Group" are sometimes used for convenience where references are made to Shell plc and its subsidiaries in general. Likewise, the words "we", "us" and "our" are also used to refer to Shell plc and its subsidiaries in general or to those who work for them. These terms are also used where no useful purpose is served by identifying the particular entity or entities. "Subsidiaries", "Shell subsidiaries" and "Shell companies" as used in this presentation refer to entities over which Shell plc either directly or indirectly has control. The term "joint venture", "joint operations", "joint arrangements", and "associates" may also be used to refer to a commercial arrangement in which Shell has a direct or indirect ownership interest with one or more parties. The term "Shell interest" is used for convenience to indicate the direct and/or indirect ownership interest held by Shell in an entity or unincorporated joint arrangement, after exclusion of all third-party interest.

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Shell's Net Carbon Intensity

Also, in this presentation we may refer to Shell's "Net Carbon Intensity" (NCI), which includes Shell's carbon emissions from the production of our energy products, our suppliers' carbon emissions in supplying energy for that production and our customers' carbon emissions associated with their use of the energy products we sell. Shell's NCI also includes the emissions associated with the production and use of energy products produced by others which Shell purchases for resale. Shell only controls its own emissions. The use of the terms Shell's "Net Carbon Intensity" or NCI are for convenience only and not intended to suggest these emissions are those of Shell plc or its subsidiaries.

Shell's net-zero emissions target

Shell's operating plan, outlook and budgets are forecasted for a ten-year period and are updated every year. They reflect the current economic environment and what we can reasonably expect to see over the next ten years. Accordingly, they reflect our Scope 1, Scope 2 and NCI targets over the next ten years. However, Shell's operating plans cannot reflect our 2050 net-zero emissions target, as this target is currently outside our planning period. In the future, as society moves towards net-zero emissions, we expect Shell's operating plans to reflect this movement. However, if society is not net zero in 2050, as of today, there would be significant risk that Shell may not meet this target.

Forward-Looking non-GAAP measures

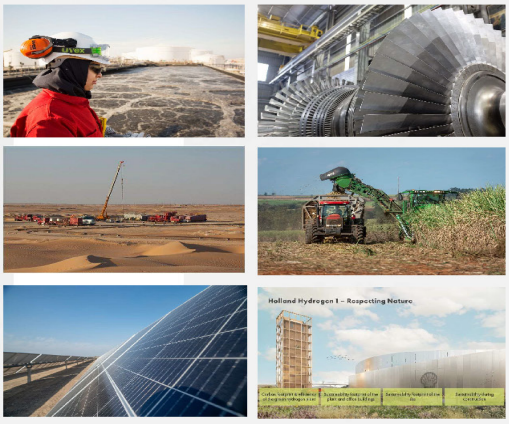
This presentation may contain certain forward-looking non-GAAP measures such as [cash capital expenditure] and [divestments]. We are unable to provide a reconciliation of these forward-looking non-GAAP measures to the most comparable GAAP financial measures because certain information needed to reconcile those non-GAAP measures to the most comparable GAAP financial measures is dependent on future events some of which are outside the control of Shell, such as oil and gas prices, interest rates and exchange rates. Moreover, estimating such GAAP measures with the required precision necessary to provide a meaningful reconciliation is extremely difficult and could not be accomplished without unreasonable effort. Non-GAAP measures in respect of future periods which cannot be reconciled to the most comparable GAAP financial measure are calculated in a manner which is consistent with the accounting policies applied in Shell plc's consolidated financial statements.

The contents of websites referred to in this presentation do not form part of this presentation.

We may have used certain terms, such as resources, in this presentation that the United States Securities and Exchange Commission (SEC) strictly prohibits us from including in our filings with the SEC. Investors are urged to consider closely the disclosure in our Form 20-F, File No 1-32575, available on the SEC website www.sec.gov.

Shell Projects & Technology

Water – Energy Connection



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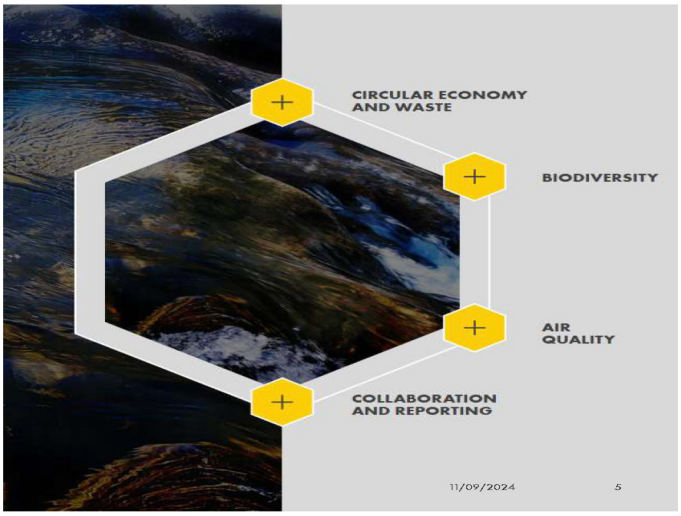
Water

Our ambition is to conserve fresh water by reducing consumption and increasing reuse and recycling

Our progress:

1. Based on our commitment to reduce the amount of fresh water consumed in our facilities, **15% reduction (compared with 2018 levels) achieved ahead of target date of 2025**
2. We are implementing water stewardship principles across our businesses - **Detailed assessments completed at eight of our downstream and upstream facilities to identify opportunities for improvement.**

Find more details at www.shell.com/water



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Carbon, Environment, Social Performance, Product Stewardship & Quality Standard

CARBON, ENVIRONMENT, SOCIAL PERFORMANCE, PRODUCT STEWARDSHIP & QUALITY — Mandatory Restricted Version 1, July 2023

Shell Projects & Technology

Water Stewardship – a holistic approach towards water management

"The use of water that is socially equitable, environmentally sustainable and economically beneficial, achieved through a stakeholder-inclusive process that involves site and watershed-based actions."

Note: All definitions are from the Alliance for Water Stewardship (AWS). Shell is not a member and presently has no registered or certified sites with AWS.

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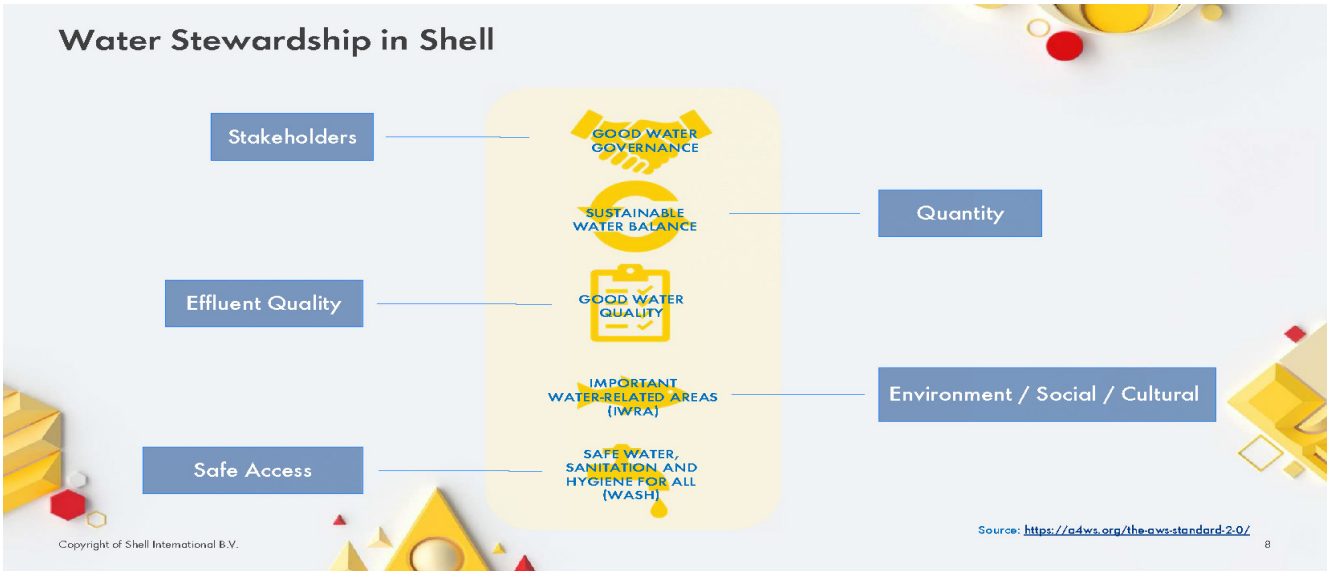
Water Stewardship in Shell
Stakeholders
GOOD WATER GOVERNANCE
SUSTAINABLE WATER BALANCE
Quantity
Effluent Quality
GOOD WATER QUALITY
IMPORTANT WATER-RELATED AREAS (IWRA)
Environment / Social / Cultural
Safe Access
SAFE WATER, SANITATION AND HYGIENE FOR ALL (WASH)
Source: https://a4ws.org/the-aws-standard-2-0/
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Ipieca – a global not-for-profit oil and gas industry association for environmental and social issues, headquartered in London.
Task Forces
6 CLEAN WATER AND SANITATION
Water Stewardship Task Force
Water Peer to Peer Task Force
Water Horizon Scanning Task Force
Water Risk and Opportunity Identification Related to Climate Chang...
IPIECA
Identifying and assessing water sources
IPIECA
Efficiency in water use
ipieca
Reuse of produced water from the onshore oil and gas industry
Evaluating opportunities and challenges
Ipieca
Review of water risk tools
ipieca
Review of drought and flood risk tools
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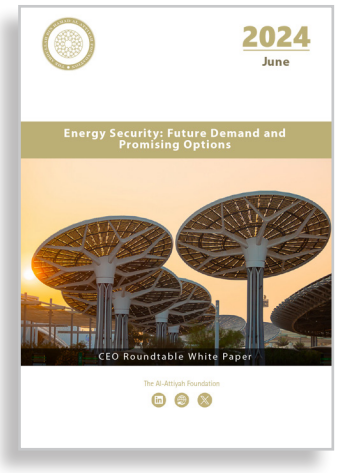

June – 2024

Energy Security: Future Demand and Promising Options

The meeting commenced with a customary welcome from H.E. Abdullah bin Hamad Al- Attiyah, extending greetings to members, guests, and speakers gathered for the second CEO Roundtable of 2024. He noted the relevance of the topic. He said that we hear much about the security of supply of fossil fuels, but equally important to suppliers is the security of demand.

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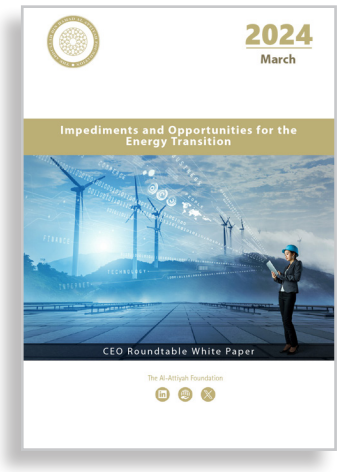

March – 2024

Impediments and Opportunities for the Energy Transition

The meeting commenced with a customary welcome from H.E. Abdullah bin Hamad Al- Attiyah, extending greetings to members, guests, and speakers gathered for the inaugural CEO Roundtable of 2024. He noted the timeliness and relevance of the chosen topic, resonating with all present.

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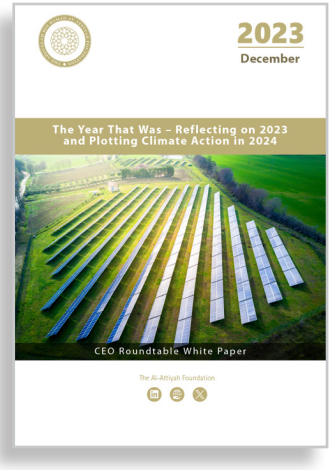

December – 2023

The Year That Was – Reflecting on 2023 and Plotting Climate Action in 2024

The Al-Attiyah Foundation's fourth CEO Roundtable of the year was held on December 6. The Trilemma for Energy, encompassing Energy Affordability, Energy Sustainability, and Energy Security, formed the basis of the session's analysis of trends witnessed over the past 12 months and predictions for 2024.

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Our partners collaborate with the Al-Attiyah Foundation on various projects and research within the themes of energy and sustainable development.

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ULUSLARARASI İŞBİRLİĞİ PLATFORMU
INTERNATIONAL COOPERATION PLATFORM
İSTANBUL
CENTER FOR THE NATIONAL INTEREST
MITSUI & CO.
earthna
GORD
Gulf Organisation for Research & Development
United Nations Global Compact
NATIONAL COUNCIL ON U.S.-ARAB RELATIONS
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