

UAE AND SAUDI ARABIA LEAD THE DECARBONIZATION OF THE MIDDLE EAST

— ACCELERATING BUSINESS DEVELOPMENT IN THE REGION —

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SUMMARY

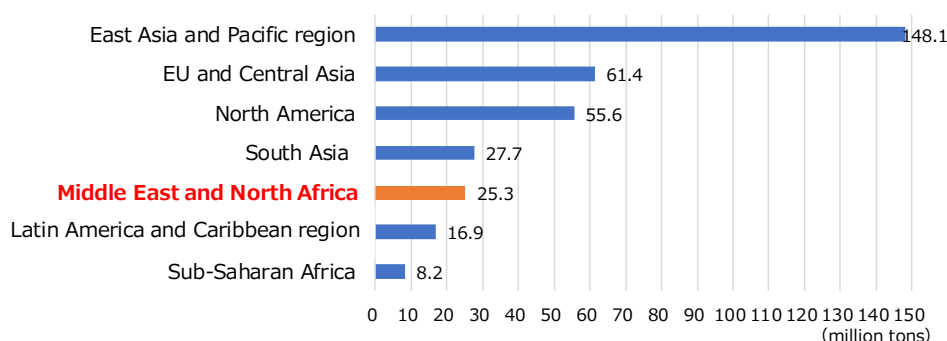
- Oil- and gas-producing countries in the Middle East, in anticipation of the future stranding of fossil fuel assets, are seeking to monetize such assets promptly by increasing the production of oil and natural gas. In parallel with this, they intend to take measures against climate change.
- The UAE and Saudi Arabia, which have declared their intent to become carbon neutral ahead of other countries in the Middle East, are leading the decarbonization of the region and are rushing to switch to renewable energy and nuclear power. They are also conducting multiple pilot projects in the hydrogen field.
- Both nations are actively promoting development of decarbonization projects in neighboring countries. Several projects are already underway, particularly in Egypt, Jordan, and Morocco, which have close relations with the two nations. Furthermore, with the easing of tensions in the region since the beginning of 2021, their presence may be expanded in Iraq and Syria, where the response to decarbonization has been delayed.

1. INTRODUCTION

Decarbonization initiatives are gathering pace in the Middle East as environmental regulations become stricter around the world. While CO₂ emissions in the Middle East are small compared with those in other regions (Figure 1), Iran and Saudi Arabia are among the top 20 emitters. The six nations of the Gulf Cooperation Council (GCC) and Libya are among the top 20 per-capita emitters.¹ These oil- and gas-producing countries are under pressure to enhance their climate change measures further. Although the state of progress of each country is different, they are making progress with the conversion to clean energy and the recovery and reuse of CO₂ while setting greenhouse gas (GHG) emission reduction targets.

This report focuses on the UAE and Saudi Arabia, which play a leading role in the Middle East, and introduces their efforts to decarbonize and give examples of their decarbonization projects being developed in other countries in the region.

Figure1. CO₂ emissions by region (2018)



Source: Compiled by MGSSI based on World Bank data

¹ See the World Bank's *World Bank Open Data* (CO₂ emissions (kt) / (metric tons per capita)).

Figure 2. Greenhouse gas emission reduction targets (by country, under the Paris Agreement: NDC)

Country name	Reduction target	Submission period	Carbon neutral
UAE	Reduction in GHG of 23.5% compared with BAU by 2030.	December 2020	Disclosed (to be achieved in 2050)
Saudi Arabia	Reduction in GHG of 278 million tons compared with BAU by 2030.	October 2021	Disclosed (to be achieved in 2060)
Bahrain	To reduce GHG, targets such as increasing the ratio of renewable energy in peak power supply capacity to 5% by 2025 and to 10% by 2035 have been set.	October 2021	Disclosed (to be achieved in 2060)
Oman	Reduction in GHG of 7% compared with BAU by 2030.	July 2021	Undisclosed
Qatar	Reduction in GHG of 25% compared with BAU by 2030.	August 2021	Undisclosed
Kuwait	Reduction in GHG of 7.4% compared with BAU by 2035.	October 2021	Undisclosed
Iran	Not submitted, since Iran has not ratified the Paris Agreement. [Supplementary data] In the INDC (draft pledge) submitted prior to COP21, Iran set a reduction in GHG of 4% (unconditional) or 12% (conditional) compared with BAU by 2030	November 2015 (INDC)	Undisclosed
Iraq	Reduction in GHG of 1-2% by own efforts or by 15% if provided with foreign funding and technical assistance	October 2021	Undisclosed

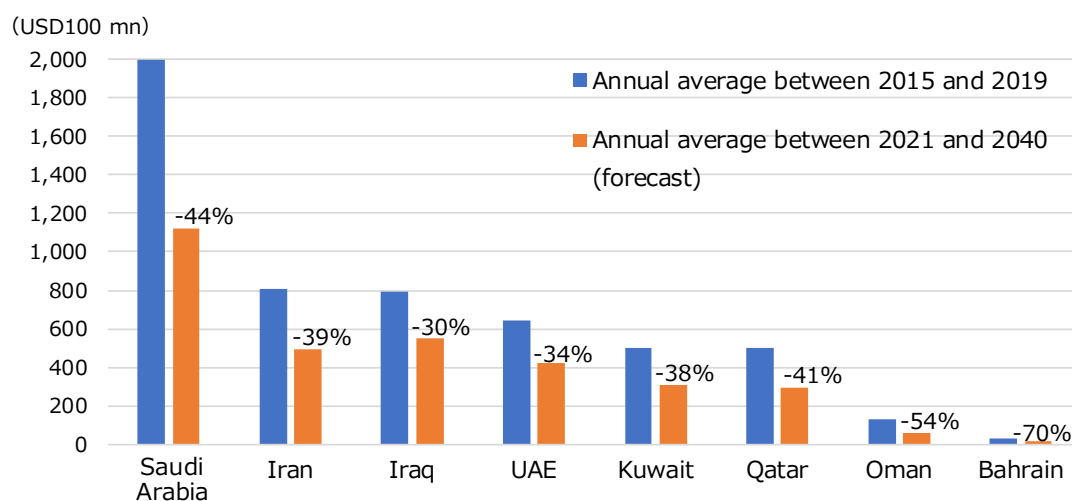
Source: Compiled by MGSSI based on the NDC Registry of UNFCCC website

2. STANCE TOWARD CLIMATE CHANGE ISSUES

2.1 Successive carbon-neutral declarations

First, this section presents an overview of the stance of oil- and gas-producing countries in the Middle East toward climate change issues. Demand for fossil fuels is expected to continue to grow, especially in Asia. Oil and gas fields in the Middle East have the economic advantage of low production costs. Nevertheless, given the urgent need to reduce GHG emissions, a decline in oil and gas revenues is inevitable in the long run (Figure 3).² Therefore, oil- and gas-producing countries in the Middle East, in anticipation of the future stranding of fossil fuel assets, are seeking to monetize such assets promptly by increasing the production and export of oil and natural gas. In parallel with this, they intend to reduce GHG emissions.

Figure 3. Middle East petrostates' oil and gas revenue forecast



Source: Compiled by MGSSI based on reports by Carbon Tracker

² In February 2021, the UK think tank Carbon Tracker published “Beyond Petrostates: The burning need to cut oil dependence in the energy transition”. The report provides the forecast of oil and gas revenues in petrostates around the world.

The timeline drawn by each country is different. In October 2021, the UAE declared that by 2050 it would be the first country in the GCC to become carbon neutral (i.e., have net-zero GHG emissions).³ This places the UAE, the host nation of COP28 in 2023, in line with the developed nations of Europe and the United States. On the other hand, Saudi Arabia, which advocates “Circular Carbon Economy (CCE)”⁴, is actively engaged in renewable energy and hydrogen projects, just like the UAE, and has set its Net Zero year to be 2060, which is the same as those of China and Russia.⁵ Saudi Arabia’s Minister of Energy Abdulaziz bin Salman Al Saud said that the roadmap “Net Zero by 2050” announced by the International Energy Agency (IEA) in May 2021 was unrealistic. As a leader in OPEC, he opposed the IEA’s view that new investment in oil and gas development was unnecessary. In addition, Bahrain, which has a close relationship with Saudi Arabia, also declared that it would become carbon neutral by 2060, following Saudi Arabia. Whether other oil- and gas-producing countries will keep pace with either the UAE or Saudi Arabia warrants continued attention.

2.2 Difference in attitude among nations yet to declare Net Zero

Although the government of Oman has not set a Net Zero goal, its state-owned oil company PDO declared in September 2021 that Oman would be carbon neutral by 2050. After Saudi Arabia and the UAE, Oman is attracting attention as a country with high investment potential in the hydrogen field.⁶ On the other hand, Qatar’s Energy Minister Saad al-Kaabi has expressed a critical view of the Net Zero declarations of other countries.⁷ The attitude of Qatar is to give top priority to increasing LNG production while giving due consideration to the environment.⁸ Although Kuwait announced its intention to develop a low-carbon strategy at COP26, the process will likely be slow due to constant government-parliamentary conflict and plans for a major reorganization of ministries from 2022. Moreover, the response to decarbonization is expected to be less important to Iran, which wants to prioritize economic reconstruction by lifting sanctions, and to Iraq, which is in financial difficulty.

3. UAE AND SAUDI ARABIA LEADING THE DECARBONIZATION OF THE REGION

3.1 Establishing a system for making electric power cleaner and exporting hydrogen

The UAE and Saudi Arabia are leading the decarbonization in the Middle East region. Both countries have vast deserts, cheap land prices, abundant solar heat and gas resources, giving them a cost advantage in the development of renewable energy and hydrogen.

For the last decade, the two countries have focused on the conversion of domestic electricity generation to renewable energy and nuclear power. The electric power sector has the largest share of CO₂ emissions by

³ Announced by Sheikh Mohammed bin Rashid Al Maktoum, the Vice President and Prime Minister of the UAE, its Minister of Defense, as well as the Ruler of the Emirate of Dubai, on October 7, 2021. He also announced plans to invest 600 billion dirhams (about USD163 billion) in the clean energy sector as part of the GHG Net Zero Plan.

⁴ It refers to the concept of decarbonization alongside utilization of hydrocarbons through four approaches: Reduction, Reuse, Recycling, and Removal. The concept has been developed since 2019. Details were announced at the 2020 G20 Summit, chaired by Saudi Arabia.

⁵ Saudi Arabia’s Crown Prince Mohammed bin Salman bin Abdulaziz Al Saud announced on October 23, 2021, that in addition to becoming carbon neutral by 2060, Saudi Arabia will double its GHG emission reduction target by 2030. Saudi Arabia intends to invest more than 700 billion riyals (about USD187 billion dollars) to achieve this.

⁶ In October 2021, the two consulting companies Cranmore Partners (UAE) and Energy Estate (Australia) announced the ranking of countries with potential for hydrogen business, based on the Hydrogen Investability Index (H2i) that both companies jointly created. The top three countries are Germany (1st), Spain (2nd) and the US (3rd). Among the oil- and gas-producing countries in the Middle East, Saudi Arabia is 17th, the UAE is 20th, Oman is 25th, and Qatar is 38th.

<https://www.h2-index.com/o>

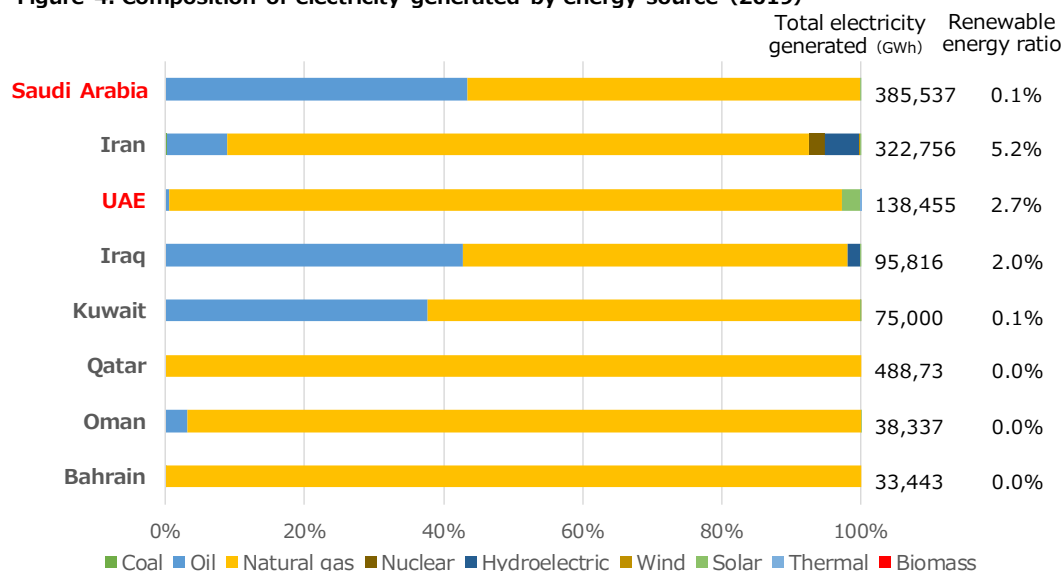
⁷ Minister of Energy al-Kaabi stated on October 11, 2021, that the 2050 Net Zero declaration by other countries was good to hear but lacking in specifics.

⁸ In February 2021, Qatar announced the final investment decision (FID) for its LNG expansion project (Phase 1). This phase will include carbon capture and storage (CCS) equipment to reduce CO₂ emissions by 25% compared with previous levels.

sector.⁹ Similar to other oil- and gas-producing countries in the region, this sector is highly dependent on fossil fuels (Figure 4).

From 2020 onwards, the COVID-19 pandemic forced the delay of some business, but in 2021, large solar power plants started operation in both countries. From 2021 onwards, multiple projects are standing by (Figure 5).

Figure 4. Composition of electricity generated by energy source (2019)



Note: The figures for the renewable energy ratio include hydroelectric power.

Source: Compiled by MGSSI base on data from IEA

Figure 5. Major renewable energy and nuclear power projects (2020 onwards)

Country	Project	Capacity	Participating company	Start of operation
Saudi Arabia (KSA)	Sakaka solar power	300MW	ACWA (KSA), Al Gihaz (KSA)	2021
	South Jeddah Noor solar power	300MW	Masdar (UAE), EDF Renewables (France), Nesma (KSA)	2022
	Dumat Al Jandal wind power	400MW	Masdar (UAE), EDF Renewables (France)	2022
	Sudair solar power	1,500MW	ACWA (KSA), Badeel (KSA), PIF (KSA)	2022
	Al Faisaliah (Shuaibah) solar power	600MW	ACWA (KSA), Al Babtain Holding Investment (KSA), Gulf Investment Corporation (Kuwait)	TBD
	Rabigh solar power	300MW	Marubeni (Japan), Al Jomaih Energy & Water Company (KSA)	2023
UAE	Barakah nuclear power	1400MW×4 units	ENEC (UAE) , KEPCO (KOR)	2020 (1st unit) 2021 (2nd unit)
	MBR solar park (3rd phase)	800MW	Gransolar (Spain), Acciona (Spain), Ghella (Italy), Masdar (UAE), EDF (France)	2020
		950MW	Shanghai Electric (China), Dow (USA)	2022
		900MW	Shanghai Electric (China), ACWA (KSA)	2021
	Al Dhafra solar power	2,000MW	CMEC (China), TAQA (UAE), Masdar (UAE), EDF (France) , Jinko Power (China)	2022

Source: Compiled by MGSSI based on press releases of each company and media coverage

In the hydrogen and ammonia fields, the UAE and Saudi Arabia each have launched a series of joint projects with companies in Europe, the United States, and Asia since the beginning of 2021. They are conducting pilot projects with an eye to future exports (Figure 6). The vision for 2030 is for Saudi Arabia to produce and export four million tons of zero-carbon fuel including hydrogen.¹⁰ The UAE wants to increase its share of the global hydrogen market to 25%.¹¹

⁹ According to World Bank statistics, as of 2014, the percentage of CO2 emissions by sector was 41.5% in the electricity sector, 36.9% in the manufacturing sector, and 21.0% in the transportation sector in the UAE. For Saudi Arabia, the figures were 49.1% in the electricity sector, 24.1% in the manufacturing sector, and 25.9% in the transportation sector.

¹⁰ Saudi Minister of Energy Abdulaziz bin Salman Al Saud made these comments at the "Green Initiative" Summit held in the Saudi capital Riyadh in October 2021.

<https://ihsmarkit.com/research-analysis/new-saudi-climate-pledge-could-boost-ccus-investment-hydrogen-.html>

¹¹ Reported by the UAE's state-run WAM news agency in an article dated November 4, 2021.

<https://www.wam.ae/en/details/1395302988986>

Figure 6. Major developments related to hydrogen

Country	Month/Year	Overview
Saudi Arabia	September 2020	Initial export of blue ammonia to Japan
	March 2021	Minister of Energy Abdulaziz bin Salman Al Saud remarks that pipeline export of domestically produced green hydrogen to Europe is under consideration.
	March 2021	Agreement to partner with Hyundai Oilbank (KOR) in the blue hydrogen business
	March 2021	Agreement to form a hydrogen-related partnership with the German Ministry of Economics and Energy
	March 2021	State-owned oil company Saudi Aramco and ENEOS (Japan) sign memorandum of understanding (MOU) on collaboration to build a clean hydrogen / ammonia supply chain.
	June 2021	Ahmad Al Khowaiter, CTO of Saudi Aramco, states that a large-scale production system for blue hydrogen will be established after 2030.
	July 2021	Air Products (US), ACWA (KSA), and NEOM (a smart city in northwestern Saudi Arabia) sign a contract to build a green hydrogen / ammonia production facility (investment of \$US5 billion, annual production of green ammonia of 1.2 million tons, scheduled to begin operation in 2025).
UAE	January 2021	State-owned oil company ADNOC concludes a MOU with the Japanese Ministry of Economy, Trade and Industry for cooperation in the field of fuel ammonia.
	May 2021	Trial operation of the first green hydrogen production facility in the Middle East begins at MBR Solar Park
	June 2021	ADNOC announces construction of a blue ammonia production facility in western Ruwais (annual production 1,000 kt; scheduled to start operation in 2025).
	May 2021	Fertiglobe, a fertilizer joint venture between the Netherlands and the UAE, participates in the Ruwais project (above)
	July 2021	Khalifa Industrial Zone (KIZAD) in Abu Dhabi announces construction of a green ammonia production facility at KIZAD (annual production of 200,000 tons).
	July 2021	Abu Dhabi National Energy Company (TAQA) and Abu Dhabi Port Authority (ADP) agree to cooperate in the production, storage, and export of green ammonia.
	August 2021	Joint research agreement concluded between ADNOC, Japan's INPEX, JERA, and JOGMEC concerning the feasibility of ammonia production
	August 2021	First shipment of blue ammonia by ADNOC to ITOCHU (Japan)
	August 2021	TAQA agrees to partner with Emirates Steel to produce green steel.
	August 2021	ADNOC announces plans to begin shipment of blue ammonia to Idemitsu (Japan).
	August 2021	Helios Industries (UAE) places order for technical research on domestic green hydrogen / ammonia business with ThyssenKrupp AG of Germany.
	August 2021	INPEX and ADNOC conclude a sales agreement for ammonia.
	September 2021	ADNOC and BP (UK) conclude an agreement for cooperation in the hydrogen business.
	November 2021	FAM Holding (UAE) signs a MOU for joint hydrogen development with Korean startup Nexon Star.
	November 2021	Mitsui & Co. (Japan) and GS Energy (KOR) participate in the Ruwais project (above).
	November 2021	ADNOC and TAQA set up a joint venture to handle renewable energy and green hydrogen.
November 2021	UAE Ministry of Industry and Advanced Technology and Russia's Ministry of Industry and Trade conclude a memorandum of understanding for collaboration in the hydrogen field.	

Note: as of Nov. 30, 2021

Source: Compiled by MGSSI based on press releases of each company and media coverage

3.2 Aggressive overseas business expansion

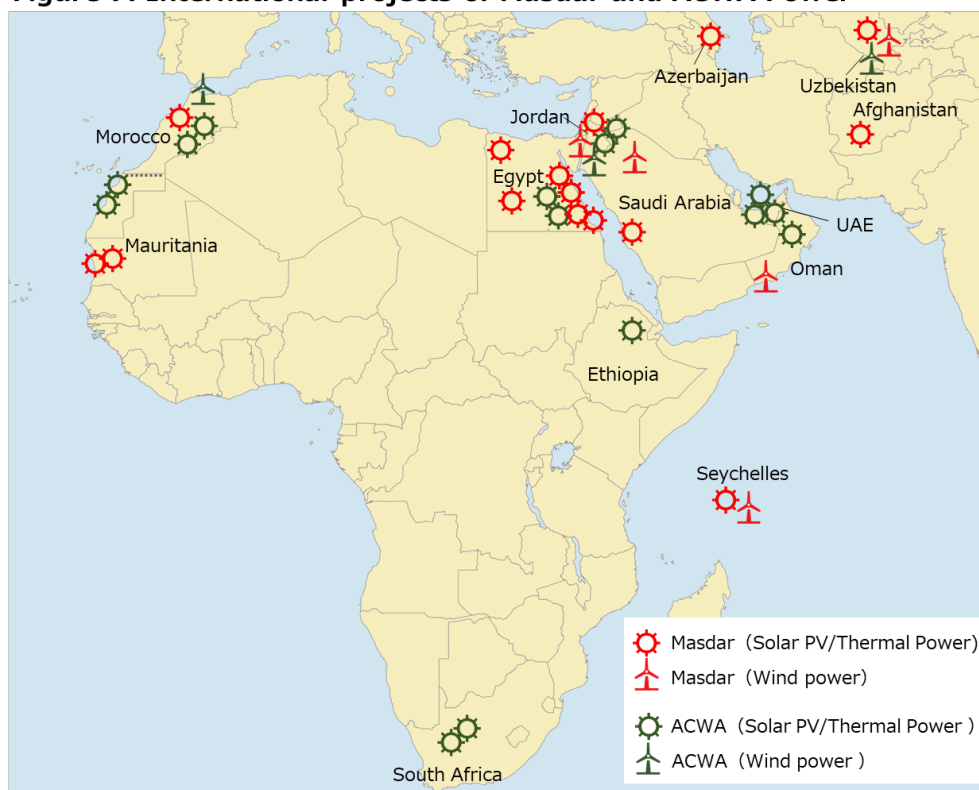
What is particularly noteworthy about the trends in the UAE and Saudi Arabia is that these nations are actively promoting decarbonization projects overseas, mainly in the power generation sector. For example, UAE renewable energy company Masdar and Saudi power giant ACWA Power are expanding their businesses not only in the GCC but also in Egypt, Morocco, Jordan, Afghanistan, Ethiopia, Seychelles, South Africa, and other places (Figure 7). For these countries, using clean energy to meet their electricity demand (which is expected to continue to increase due to population growth) will also reduce their dependence on fossil fuel imports. The overseas expansion by these two companies is also a move to meet these needs.

In recent developments, the UAE has launched a joint venture with the government of Egyptian President Abdul Fattah al-Sisi on the back of its close relationship with the state. Specifically, a UAE fertilizer company reached an agreement with Norwegian solar power company Scatec in October 2021 to build a green hydrogen production facility in Egypt.¹² Furthermore, the UAE is also showing signs of exploring collaboration

¹² The facility has a capacity for electrolysis of 50 to 100 MW and is scheduled to start operation in 2024. The parties to the agreement are the UAE fertilizer company Fertiglobe, the Norwegian solar power company Scatec, and the Egyptian sovereign wealth fund TSFE. <https://scatec.com/2021/10/14/scatec-partners-with-fertiglobe-and-the-sovereign-fund-of-egypt-to-develop-green-hydrogen-as-feedstock-for-ammonia-production-in-egypt/>

opportunities within the Middle East with Italian and French companies,¹³ and it is expected that new initiatives for overseas expansion will emerge in the future.

Figure 7. International projects of Masdar and ACWA Power



Note: Masdar also operates solar home systems in local cities in Morocco and Egypt, although they are not included in this figure.

Source: Compiled by MGSSI based on the press releases of each company

Saudi Arabia is taking the same stance as the UAE in leading the decarbonization of the region. Its most recent move is to lay a transmission line connecting the two countries with Egypt to mutually supply electricity derived from renewable energy. They have begun to develop a system that can accommodate both shortages and surpluses of electricity.¹⁴ At the same time, Saudi Arabia is showing a different approach to the one taken by the UAE. The "Green Initiative" announced by Saudi Arabia's Crown Prince Mohammed bin Salman in March 2021 advocates a more comprehensive regional alliance framework rather than bilateral collaboration. It called on neighboring countries for a 60% reduction in CO₂ emissions from oil and gas production and the planting of 50 billion trees. The leaders of Tunisia and Morocco participated in the first summit of the Green Initiative held in Riyadh at the end of October 2021. Saudi Arabia appears to be aiming to extend its efforts to North African countries.

¹³ In September 2021, two MOUs were signed respectively between Mubadala Petroleum (a subsidiary of the Abu Dhabi government-affiliated investment fund "Mubadala Investment Company") and Eni, a major oil company in Italy, and also between UAE's National Petroleum Construction Company (NPCC) and Technip Energies, a French engineering company to advance energy transition in the Middle East. The signatories of both MOUs agreed to explore cooperation opportunities within the region.
<https://www.eni.com/en-IT/media/press-release/2021/09/mubadala-petroleum-and-eni-sign-mou.html>
<https://www.technipenergies.com/media/press-releases/technip-energies-partners-npcc-advance-energy-transition>

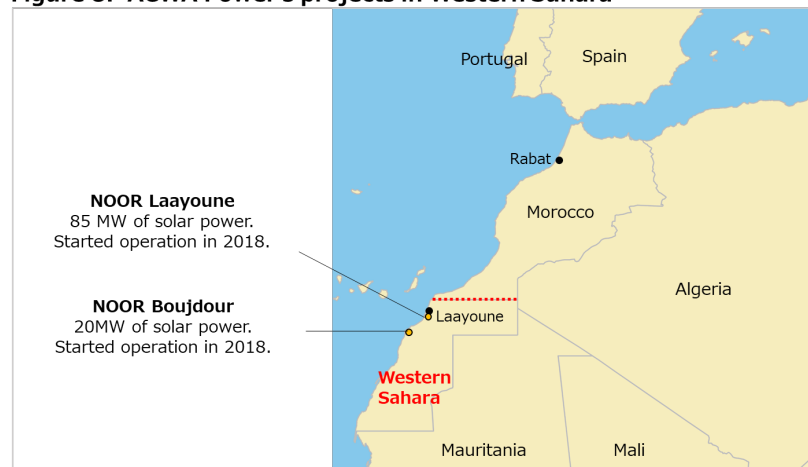
¹⁴ In October 2021, Hitachi Energy (formerly Hitachi ABB Power Grid) received an order for a large-scale high-voltage direct-current transmission (HVDC) system between Saudi Arabia and Egypt from Saudi Services for Electro Mechanic Works (of Saudi Arabia) and Orascom Construction of Egypt. The power transmission lines will have a total length of 1,350 km and will have a maximum carrying capacity of 3,000 MW. According to Orascom, work on the transmission lines in Egypt is expected to be completed by 2025. Press release from Hitachi Ltd. dated October 6, 2021: <https://www.hitachi.co.jp/New/cnews/month/2021/10/1006a.html>
 Press release from Orascom dated October 5, 2021:
<https://orascom.com/updates/orascom-construction-consortium-to-connect-the-national-power-grids-of-egypt-and-saudi-arabia/>

3.3 The growing presence of both countries even in politically unstable countries

There are many countries in the Middle East, such as Iran and Iraq, that have political and security problems. The UAE and Saudi Arabia may take advantage of their financial strength and geographical proximity to drive decarbonization in countries where foreign capital tends to be scarce. Increased geopolitical risk usually becomes a bottleneck in investment decisions. However, economic rationality alone cannot explain the moves by both countries involved in political speculations in the power balances between the nations of the Middle East.

One example is Morocco. ACWA Power of Saudi Arabia operates two solar power plants that are located in the disputed area of Western Sahara (Figure 8). In Western Sahara, the conflict between Morocco (which effectively controls the area), the armed group Polisario Front aiming for independence, and Algeria (which supports the Front) has continued for nearly half a century. As a result, large companies have tended to refrain from expanding into Western Sahara. On the other hand, Saudi Arabia is thought to have launched a power plant in Western Sahara because it has maintained a generally good relationship with the Moroccan royal family and has basically supported the Moroccan side in the Western Sahara issue. In addition, Morocco's normalization of diplomatic relations with Israel in December 2020¹⁵ is likely to have further strengthened relations with Saudi Arabia—a country said to be supporting the Arab-Israeli peace process.

Figure 8. ACWA Power's projects in Western Sahara



Source: Compiled by MGSSI based on the press releases of ACWA Power

In October 2021, Masdar of the UAE signed a contract with the Iraqi government to build a solar power plant with a generation capacity of 1 GW. The UAE is increasing its presence in Iraq against the background of the mitigation of the Arab-Iranian conflict that has been ongoing since the beginning of 2021. In November, on the occasion of the first visit of UAE Minister of Foreign Affairs Abdullah bin Zayed Al Nahyan to Syria since the outbreak of the Syrian Civil War in 2011, it was reported that the two countries agreed to build a solar power plant with a capacity of 300 MW near the Syrian capital of Damascus.¹⁶

4. CONCLUSION

Since the beginning of 2021, attempts at dialogue between major countries in the region have gathered pace, due to changes in the environment such as the economic downturn caused by the COVID-19 pandemic and the inauguration of the Biden administration in the United States. In addition to the restoration of diplomatic

¹⁵ The former US Trump administration announced that it would recognize Morocco's sovereignty throughout Western Sahara at the same time as Morocco's normalization of diplomatic relations with Israel. According to media reports, US's recognition of Morocco's sovereignty in the Western Sahara was in return for Morocco's normalizing diplomatic relations with Israel.

¹⁶ The UAE reopened its embassy in Syria in December 2018. The UAE has been improving relations with Syria. In October 2021, Crown Prince Sheikh Mohammed bin Zayed Al Nahyan, the UAE's de facto ruler, held a telephone conversation with Syria's President Bashar al-Assad.

relations with Qatar by Saudi Arabia, the UAE, and others in January¹⁷ and the Saudi Arabian-Iranian high-level talks in April¹⁸, the UAE announced in September a growth strategy to improve relations with neighboring countries¹⁹. Such signs of relief in tensions will likely act as a tailwind: It will help push forward the massive funding for decarbonization promoted by the UAE and Saudi Arabia and investment promotion policies to bring in large companies with advanced technology and human resources from overseas. In addition, it will also help drive forward the Saudi-led Green Initiative.²⁰

Moreover, it is expected that both countries will expand their role in decarbonization in nations where investment capacity is scarce and in countries where the inflow of foreign capital is hampered due to security concerns. In Iraq, Syria, and Lebanon, which depend on the import of electricity and fuel for power generation, there are frequent power outages due to financial difficulties and fragile infrastructure. There is also the risk that the spread of protest demonstrations may further shake the political systems. To date, the UAE and Saudi Arabia have had a limited presence in these three countries due to their strong political and military ties to Iran. However, the tide is turning. Iran has given priority to improving relations with Arab countries amid a situation where the path towards the lifting of sanctions is unclear and its domestic economy is weakening. Going forward, the economic giants of the UAE and Saudi Arabia will likely use the mitigation of the Arab-Iranian conflict as a tailwind and strengthen business development in neighboring countries such as Iraq, Syria, and Lebanon, which need to switch to clean energy sources for the stability of their governance.

¹⁷ Since June 2017, Saudi Arabia, the UAE, Bahrain, and Egypt severed diplomatic relations with Qatar because of Qatar's support for the Muslim Brotherhood and its approach to Iran.

¹⁸ According to media reports, a total of four meetings were held between the two countries between April and November 2021.

¹⁹ The UAE announced its 10 Principles on September 5, 2021. President issued decree on the adoption of these Principles on October 9. The 10 Principles are positioned to complement the National Agenda 2021 approved by the UAE Cabinet on June 27. One of the 10 Principles is "Good-neighbourliness is the basis of stability."

<https://www.wam.ae/en/details/1395302978675>

²⁰ Qatar, where relations with Saudi Arabia have been improving since the restoration of diplomatic relations, announced at the end of October 2021 that it would plant one million trees by the start of the 2022 FIFA World Cup, and 10 million trees by 2030, indicating a stance of cooperation with the Saudi Arabia.