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Disentangling the SDGs agenda in the GCC region: Priority targets and core areas for environmental action

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The agenda of the Sustainable Development Goals (SDGs) is a key international outcome for guiding development efforts of nation states. However, SDG targets cover vast areas of action, and they are difficult to break down and monitor for countries with different developmental situations and needs. Often, global rankings of countries' compliance with the SDG agenda are plagued with false signals and methodological limitations. This paper presents a much-needed prioritization of the SDG targets for the Gulf Cooperation Council (GCC) region. It maps SDG targets and outlines priorities and key areas for environmental action. Sustainability in resource use, consumption and production constitutes a primary area for investments. Education and awareness represent cross-cutting priorities and low-hanging fruit for action. Tackling climate change and emerging supply risks and the management of ecosystems represent an action area in which GCC governments can intensify their interventions. As a supporting policy, regional environmental cooperation is important for enhanced commitments and tackling transboundary aspects of the SDG agenda. The analysis of the SDG agenda in the GCC regions reiterates the importance of countries engaging with global sustainability framings in order work out their own interpretations in congruence with national development realities. Such an SDG regional mapping exercise also assists national-level planners or regional bodies working on development issues in shaping the Gulf region's engagement with the global sustainability agenda and tracking progress on key SDG priorities.

KEYWORDS

sustainable development goals (SDGs), Gulf Cooperation Council (GCC), global sustainability agenda, sustainable consumption and production, ecological footprints, education for sustainable development

Introduction

The Sustainable Development Goals (SDGs) represent a key pillar of the global sustainability agenda, which also includes other global accords such as the 2015 Paris Agreement. Such globally endorsed agreements have set targets (for the year 2030 in the case of the SDGs and the Paris agreement) that serve as orientation frameworks for national policymaking. Success in achieving the SDG agenda is measured in terms of achieving the 169 SDG targets, which are comprehensive but with many trade-offs and synergies among them all (Kroll et al., 2019; Fonseca et al., 2020). In contrast to the Millennium Development Goals (MDGs, 2002–2015), the SDGs are not oriented towards underdeveloped countries. Their global validity stems from incorporating ambitious goals for countries at different levels of economic development. The SDG agenda also represents an umbrella for policies regarding low-carbon and green developments. However, not all SDG targets are relevant for all countries, and besides, the large number of targets can make it difficult to monitor and institutionalize progress towards the implementation of the SDGs. The upshot of this is that the periodic reports on progress towards the SDGs are often done in an *ad hoc* manner. Governments, national organizations, and companies tend to "cherry-pick" SDGs based on little analysis or insufficient explanations regarding their prioritization, leading to superficial implementation or merely symbolic commitment ("SDG-washing") (Forestier and Kim, 2020; Heras-Saizarbitoria et al., 2022).

Another problematic aspect of the implementation of the SDGs is that these goals largely lack consistent and evidence-based frameworks (Allen et al., 2018). Furthermore, the academic literature on the SDGs often lacks perspectives on integrated monitoring and evaluation (Bennich et al., 2020). As a result, there have been several calls for the development of more emphasis and prioritization in applying the SDGs at a regional or local scale. For example, Allen et al. (2017) suggested for the Arab world a prioritization of SDGs based on norms such as human dignity and well-being, natural resource protection, and peace. Similarly, Bissat and Rihan (2019) stress the importance of contextualizing the SDG agenda, and suggest peacebuilding and the reduction of inequalities as key issues for the Arab region. Other global prioritization endeavors suggest that a group of interlinked SDGs is more important than the other ones individually; e.g., SDGs 1, 2 and 6, since they are important for basic supplies and economic survival (Yang et al., 2020). So far, there has been no contextualization of the SDG priorities with regard to the Gulf Cooperation Council (GCC) countries of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates (UAE).

It will remain challenging to break down the SDGs into more context-specific priorities. However, there is a pressing need for such a prioritization at the level of national states or of regions that share similar economic or hydro-climatic characteristics. Such a prioritization would help national governments better appreciate the SDG agenda and engage in implementation and reporting. This paper responds to this need by analyzing the prioritization and relevance of the SDG targets with regard to environmental action needs in the GCC region. Using mapping of targets and data from SDG monitoring instruments, the paper presents the priority targets for the GCC region. It later outlines the core areas of environmental action relevant to achieving the SDGs, and discusses the progress of GCC countries in these areas. In this sense, the paper provides valuable insights for policymakers in terms of priority issues for public investments and pathways for integrating the SDG agenda into local strategies.

Case study and justification

Relevance of the SDG agenda for the GCC region

The GCC region is composed of largely arid countries that are economically well developed. GCC countries share the same grand environmental challenges in terms of water scarcity, large ecological footprints, destruction of marine ecosystems, and the negative impacts of climate change (Saif et al., 2014; Al-Maamary et al., 2017; Burt et al., 2017; Al-Saidi and Saliba, 2019). For a long time, insufficient attention was paid to these challenges by policymakers who were (and probably still are) more oriented towards economic goals such as gradually diversifying government revenues while maintaining the high income levels of citizens and the generous benefits awarded to them by the state (Zaidan et al., 2019). Often in the past, environmental impacts of physical scarcity and environmental damage have been addressed in an *ad hoc* manner through water desalination, exchange of oil for food, and some environmental remediation of (marine) ecosystems (Sale et al., 2011; Woertz, 2013; Al-Saidi, 2019). After decades of economic growth powered by plentiful fossil-fuel revenues distributed to rather small populations, GCC states have recently become more engaged with the global sustainability agenda. While GCC states—led by Saudi Arabia—have for a long time tended to reject global environmental efforts such as climate agreements, they are now less skeptical regarding the global environmental governance system. Al-Saidi et al. (2019) have detailed how GCC countries have recently become interested in the global sustainability agenda through international agreements including the SDG agenda, the Paris Agreement, and several environmental regimes.

GCC countries are now engaged within frameworks that understand development from a comprehensive perspective; for example, they adopted the SDG agenda along with all its reporting and monitoring instruments. They have also sought to align this agenda with their national visions and mainstream

parts of it in their regional (e.g., using GCC-wide instruments) or international (e.g., through engagement with UN-based actors or organizations such as the Global Green Growth Institute) state environmental relations (Al-Saidi, 2021). Furthermore, more comprehensive environmental approaches based on ideas such as resilience, ecosystem management, integrated management or inter-sectoral coordination are increasingly important for GCC states (Burt et al., 2017; Abulibdeh et al., 2019; Al-Saidi and Saliba, 2019).

The reasons for the increased sustainability engagement of GCC states are threefold. Firstly and most importantly, there are urgent economic consequences arising from increasing local demands due to population and economic growth. These growths have meant that the distributive nature of GCC states (low levels of taxation, attractive public jobs, subsidies for basic services such as water and energy, and individual subsidies for GCC nationals) are difficult to maintain in the long run, especially with fluctuating global energy prices (and hence fluctuating state revenues). For example, increasing local demands have necessitated reforms such as energy subsidy reductions and energy diversification (through renewables), as otherwise, GCC states might soon have to use all their fossil fuels destined for export to satisfy local consumption (Gately et al., 2012; Al-Saidi, 2022a). In fact, economic diversification through decreasing the reliance on fossil fuel revenues represents a paramount goal for the development strategies of GCC states.

Efforts to diversify GCC economies date back to the early 1970s, with little success in significantly lowering the dependence on fossil fuels (Albassam, 2015). Structural challenges to such diversification include the strong role of states and the lack of interregional trade or specialization among GCC states (Hvidt, 2013). GCC states have tried several tools for economic diversification, including sovereign wealth funds (El-Kharouf et al., 2010) and the introduction of environmental innovations (Al-Saidi and Elagib, 2018). Engagement with the sustainability agenda through, for example, the deployment of sustainable energy can help break up the high proportion of GCC economies tied up in the oil and gas sectors (Flamos et al., 2013). The challenges facing economic diversification in the Gulf region are also similar to those facing many developing countries, particularly fossil fuel-exporting economies (Mishrif, 2018). For example in Azerbaijan, state revenues from fossil fuel resources are economically significant, but they can be invested in diversification or economic modernization (Sadik-Zada, 2020; Sadik-Zada et al., 2021). Without a sustainable strategy for managing such revenues (e.g., through investments in sustainability efforts), oil-exporting countries risk economic slowdown (including the "Dutch disease" phenomenon of deteriorating economic performance despite fossil fuel exports) (Niftiyev, 2020; Niftiyev, 2021).

Secondly, international pressure on and expectations of GCC countries to engage with sustainability have increased in recent decades since these countries are often criticized for exhibiting large *per capita* consumption footprints and blocking some parts of the international climate agenda (Depledge, 2008; Krane, 2018). Thirdly and finally, the technological and economic feasibility of many environmental technologies has provided "win-win" opportunities for GCC countries to satisfy environmental requirements and save costs or attract investments. For example, GCC states are now interested in an "ecological modernization" through "eco-innovations," particularly in the built environment, in order to maintain their modern images and attract high-value residents and investors (Al-Saidi and Elagib, 2018). Furthermore, engaging in the energy transition agenda is worthwhile since saved revenues from energy subsidy reductions can be redirected towards more productive uses (e.g., development of renewables or direct welfare transfers) (Abdel Gelil et al., 2017; Al-Saidi, 2022a). Moreover, renewable energies (particularly solar energy) have proven to be very economical in the Gulf region, with new photovoltaic plants producing energy at world-record prices (e.g., 0.01 USD per Kwh) (Bellini, 2021).

SDGs monitoring and (false) signals

Progress reporting on the SDG agenda is carried out using the periodic Voluntary National Reviews (VNRs), which all countries submit to the High-level Political Forum (HLPF) of the United Nations (UN). However, these reviews are often unspecific, and they include descriptive listings of achievements based on the progress of achieving local policies, or overarching national visions (Al-Saidi, 2021). Global monitoring instruments such as the SDG index can give incoherent or false signals. Table 1 provides a comparison of the SDG rankings of GCC countries in 2017 and 2020, and shows significant discrepancies, particularly with regard to SDGs 11, 13, 14, and 15. This is due to the reliance on a small set of indicators, sudden changes in indicator values, or the specific sets of indicators used for the respective SDGs. For example, on SDG 13, Qatar dropped from 59 in 2017 to 15 in 2020. This was due to a change in value of the indicator "imported CO_2 emissions, technology-adjusted (tCO_2/capita)" from a good value of -6.5 in 2017 to a bad value to of 1.7 in 2017. Furthermore, among the three indicators used for this SDG, the "Climate Change Vulnerability Index" used in 2017 (with Qatar scoring well) was replaced in 2020 with the indicator "CO_2 emissions embodied in fossil fuel exports (kg/capita)" (with Qatar performing badly). These inconsistencies are also present in other SDGs not shown in Table 1. For example, the UAE's score on SDG 17 (partnership for the goals) dropped from 100 in 2017 to 51 in 2020, due to a value change of just one indicator. The UAE scored 0 on the indicator "tax haven score (best 0–5 worst)" in 2017, and in 2020, the score changed to 98.3 on the new but very similar indicator of "Corporate Tax Haven score (best 0–100 worst)".

TABLE 1 Scoring of GCC countries on environmentally relevant goals in the SDG index (data source: Bertelsmann Stiftung and Sustainable Development Solutions Network, 2017; Bertelsmann Stiftung and Sustainable Development Solutions Network, 2020).

GCC Country	Index Score[a]		Index Rank[b]		SDG 6[a]		SDG 7[a]		SDG 11[a]		SDG 12[a]		SDG 13[a]		SDG 14[a]		SDG 15	
	y20	y17	y20	y17	y20	y17	y20	y17	y20	y17	y20	y17	y20	y17	y20	y17	y20	y17
Bahrain	69	65	82	92	71	50	94	89	52	70	68	74	63	50	65	31	61	40
Kuwait	63	62	112	102	49	49	93	86	54	26	37	24	34	59	51	36	55	40
Oman	70	64	76	94	51	50	87	79	78	67	72	61	64	74	70	55	57	37
Qatar	65	63	103	98	57	49	89	78	36	47	70	57	15	59	61	39	58	40
SA	66	63	97	101	48	58	89	83	42	0	66	59	59	73	60	46	49	35
UAE	70	66	71	77	56	50	91	83	78	31	52	45	29	48	67	48	58	29

[a]Score range from 0 to 100.
[b]Rank in the SDG, index among 166 countries.
Abbreviations: y20, value for the year 2020; y17, value for 2017; SA, saudi arabia; UAE, the United Arab Emirates; SDG 6, Clean Water and Sanitation; SDG 7, Clean and Affordable Energy; SDG 11, Sustainable Cities and Communities; SDG 12, Sustainable Consumption and Production; SDG 13, Climate Change; SDG 14, Life below Water; SDG 15, Life on Land.

Mapping methodology and outcomes: Steps for outlining SDG regional relevance

The highlighted problems with global rankings and monitoring instruments illustrate the need for more consistent assessments based on local or regional realities. There is evidence that national governments do not care about all SDGs in the same manner, but rather prioritize them in accordance with their existing national development policies. Studies examining national policies have developed several specific SDG priorities, such as high-income countries prioritizing SDGs related to economic development (e.g., SDGs 1 and 8) (Forestier and Kim, 2020). Similarly, small-island states tend to give more weight to economic and societal SDGs; e.g., SDGs 2, 3, 4, 8 and 9 (Eppinga et al., 2022). There are also several studies that suggest normative SDG prioritizations based on general development needs or the relevance of particular concepts for a certain region. For example, during the implementation of the SDG agenda, the Arab region might emphasize issues such as human dignity and its linkages to natural resources, governance, and peace (Allen et al., 2017). Hepp et al. (2019) see gender equality (SDG 6) as a cross-cutting and central priority across the whole SDG agenda. In the wake of COVID-19, several studies have argued for concepts such as the circular economy, green management, and green recovery as some of the central aspects of the SDG agenda (Sharma et al., 2021; Shulla et al., 2021; Ameli et al., 2022).

The methods and criteria used for selecting relevant SDGs or appropriate SDG policies in the pertinent academic literature largely depend on the goal of the mapping exercise. Arguably, a large number of publications using SDG mapping have sought to identify trade-offs, interdependencies or synergies in a general conceptual manner or applied to a specific (national) case (e.g., Fuso Nerini et al., 2018; Breuer et al., 2019; Kroll et al., 2019). The SDGs have also been examined with regard to certain types of enabling policies; e.g., required economic policies in Africa (Basheer et al., 2022). There are only a handful of publications seeking to outline the relevance of the agenda and regional SDG priorities. Forestier and Kim (2020) offered a prioritization exercise for 19 countries at varying economic levels (and from different regions) using both VNR declarations and quantitative indicators related to aid flows. There are SDG mappings on more coherent regions such as the SDG ranking in small-island states using students' surveys by Eppinga et al. (2022).

For the Arab region, Allen et al. (2017) relied on indicator-based assessment of SDG indicators to conclude some missing gaps to be addressed or prioritized in future action. Similarly, Allen et al. (2018) reviewed SDG progress in the Arab region using VNRs and the academic literature to identify policy-level gaps (e.g., the need for more integrated and comprehensive action). In contrast, this paper proposes an SDG mapping of a region that is arguably socio-economically and politically quite coherent. It also uses a qualitative analysis of self-declared policies by GCC states and reviews the academic literature for contextualization. It relies on the study of national development policies since they are the main formal guidance for national development efforts. As previously mentioned, VNRs can include some bias as they are often designed to satisfy UN-level reporting requirements through listing achievement points and showcasing compliance. In addition, gauging stakeholders' perceptions of priorities (e.g., through interviews and surveys) poses methodological challenges with regard to its feasibility and representativeness in evaluating perceptions on an all-encompassing agenda with an unmanageable number of targets.

This paper proposes a mapping of the SDG targets in order to gauge the relevance of specific SDGs for the GCC region based on an analysis of national-level policies, with a particular focus on environmental outcomes. The mapping methodology will be

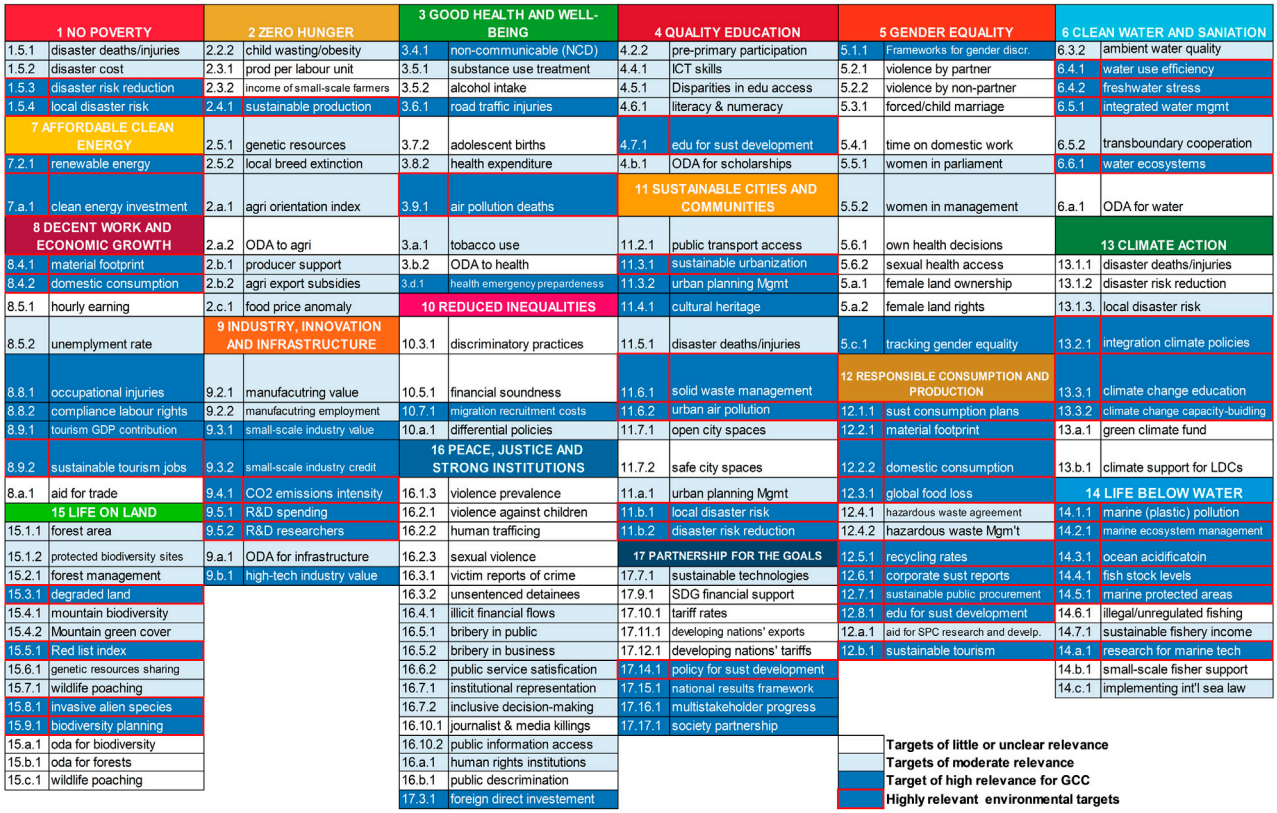

FIGURE 1
Mapping of relevant SDG targets for the GCC region.

explained in this section. The first step was to eliminate non-relevant targets, and hence the mapping results (Figure 1) show only slightly, moderately, or highly relevant targets. The targets not shown in this mapping are deemed to be of no relevance due to high achievement or high economic development levels. These are largely targets related to poverty, food security, access to basic services, control of infectious diseases, and safety, all of which are more oriented towards developing or least-developed countries. Secondly, the SDG targets with little or unclear relevance represent issues based on either one of the following criteria: They should have not been highlighted as relevant areas either in national policies such as national visions or corresponding by-laws and strategies. Alternatively, the relevance of some of these targets can be unclear due to the lack of data on compliance with these targets. The targets include issues such as official development assistance (ODA) for certain areas, specific forms of crime, or specific inequality indicators.

Thirdly, targets with moderate relevance are determined based on the baseline criteria of being mentioned in national policies as important issues as well as on three additional criteria: that 1) the performance of the GCC states on these issues is relatively fair, 2) the issues are not marked as (high) priorities in national policies, and/or 3) the issues are of limited national relevance. Examples of the first criterion include unemployment, wildlife protection, public transport and open spaces, hazardous waste, performance of public institutions, illegal fishing, or fishers' income. The second criterion covers targets such as agricultural support, substance use, or women's participation as a few examples that are mentioned in national policies but do not present pressing issues or are not consistently marked as (high) priorities. For the third criterion, as an example, the GCC region is not prone to natural disaster such as droughts or floods, although the issue of disaster risk is still important due to the potential for industrial accidents, heatwaves, or occasional storms, which are an issue in Oman, for example. In this case, SDGs related to disaster damage are only moderately relevant, while SDGs related to disaster management itself are highly relevant. Furthermore, the region does not feature a wide cover of mountains and forests, although these issues can be relevant in some areas in Saudi Arabia or Oman.

In the final step, targets designated as highly relevant are determined based on two baseline criteria of 1) uncompetitive

scoring on these goals and 2) being mentioned as high priorities in national strategies. To arrive at these targets, national development policies (i.e., national visions and corresponding implementation strategies) were screened using qualitative research support systems (the software MAXQDA). In the event that any text on policies or targets was evaluated to be relevant to a certain SDG target, it was coded to correspond to that target. The screening of these strategies was applied for each SDG target, but the resulting grouping of targets was sequential. This means that targets not highlighted in strategies were added to an initial group and later checked across other criteria (earlier mentioned in Steps 1 and 2) to determine targets of no or little relevance. The remaining targets (i.e., those mentioned in national strategies as relevant issues or high priorities) were assigned to the group of moderately or highly relevant targets (Steps 3 and 4). The other criteria for moderately relevant targets (Step 3) resulted in a narrowing of the remaining targets. In the final step (4), only those targets that are explicitly mentioned as high priorities remained, and they were checked against the additional necessary criterion of uncompetitive scoring of GCC states. Most of these highly relevant targets are environmental ones, which will be detailed in the next section with regard to their relevance but also to the underachievement of GCC states of these targets.

In addition to these environmental targets, other highly relevant targets included tourism's contribution to GDP, the situation of the labor workforce, industrial development, traffic safety, and societal participation. In general, there is a large number of indicators that can be used to verify the scoring of GCC states on any one SDG target, although presenting such indicators on the large number of targets is beyond the scope of this paper. Arguably, the performance of GCC states in these areas lags behind that of benchmark countries. For example, on non-environmental targets deemed highly relevant, one can cite road traffic accidents as a major cause of death in the Gulf region (Dahim, 2018). The situation of the labor workforce in the immigration-dependent Gulf region is a much publicized debate that includes tackling mobility restrictions of labor (e.g., sponsorship requirements or migration costs), or occupational injuries—all subjects of recent reforms by GCC states (Aarthi and Sahu, 2021). Tourism and its contribution to GDP is a major theme for GCC diversification efforts, with GCC states still dependent on fossil fuel revenues and lacking foreign direct investments (with the exception of the tourism hotspot of Dubai) (Eissa and Elgammal, 2019; Scharfenort, 2020). In addition, industrial development is weak with the exception of extractive industries. Finally, societal participation is important as GCC states still face important challenges with regard to gender equality issues such as women's labor participation (Murray and Zhang-Zhang, 2018).

Results: Core areas for environmental action

The primacy of sustainable resource use, production, and consumption

A primary area for environmental action in the GCC region is encouragement of the sustainable use of the key resources of water and land, and reducing the large footprints of consumption and production. Table 2 presents some data showing the high pressure on freshwater resources and the comparatively large consumption and production footprints. Water overuse and scarcity, and hence the scarcity of arable land for agriculture, have been major concerns in the region, and as a result, issues such as sustainable agriculture, water use efficiency and integrated water management represent paramount priorities (Saif et al., 2014; Brown et al., 2018). Furthermore, in comparison to high-income countries, the levels of energy intensity, emissions footprints, and air pollution due to fuel burning and construction are relatively high (Table 2). This necessitates the prioritization of SDG targets related to sustainable production, footprints, and sustainable urban planning. Issues such as tackling pollution, lowering ecological footprints, and achieving renewables targets have thus been incorporated in the national visions of all the GCC states (Al-Saidi and Elagib, 2018).

Table 3 shows the relevant environmental SDG targets for the different environmental action areas. There are several targets associated with sustainable resource use, consumption, and production, which largely focus on reducing production and consumption footprints. Issues such as water management in general and solid waste management are classic priorities in the GCC region. GCC states have developed several national and regional policies to tackle water stress, expand water (re)use options, and establish integrated plans (Aleisa and Al-Zubari, 2017; Zubari et al., 2017). Solid waste management practices are increasingly encouraging activities based on the circular economy and recycling (Hahladakis and Aljabri, 2019; Alagha et al., 2022). Lowering the footprints of consumption and production is still an important action area in the GCC region, which exhibits 2.5 to 3 times higher domestic material consumption *per capita* in comparison to the global average (ESCWA, 2021). The large production and consumption footprints are associated with urban lifestyles, construction activities, and expansion of the built environment. Therefore, sustainable urbanism is a directly associated priority, and it can be enhanced through circular economic interventions including recycling, sustainable urban agriculture, and water reuse (Al-Saidi et al., 2021). In addition, the tourism sector is responsible for large amounts of resource waste (including food waste), and so should be targeted for environmental action by GCC governments (Pirani and Arafat, 2016).

TABLE 2 Selected indictors on resource availability and use footprints in the GCC region.

	BHR	KWT	OMN	QAT	SAU	ARE	MENA	HIC
Freshwater withdrawals (% of available freshwater resources)[a]	133	3,851	117	431	992	1,667	234	81
Energy intensity level of primary energy (MJ/$2011 PPP GDP) (2015)	2.7	1.5	1.8	1.8	1.6	1.4	1.5	1.3
CO_2 emissions from fuel combustion for electricity and heating per total electricity output (mtCO2/TWh) (2017)	1.1	1.3	1.9	1.9	1.6	1.6	1.6	1.2
Annual mean concentration of particulate matter of less than 2.5 microns in diameter (PM2.5) (μg/m3) (2017)	70.8	60.7	41.1	91.2	87.9	40.9	56.8	14.6
Domestic material consumption per capita, by type of raw material (tonnes) (2017)	28.5	29.6	31.7	49.9	25.0	22.5	NA[c]	NA[c]
Municipal solid waste (kg/capita/day)[b]	1.9	1.1	1.2	1.0	1.6	1.8	1.2	1.9
Production-based SO_2 emissions (kg/capita) (2012)	87.5	284.2	49.4	66.7	72.3	43.4	25.4	54.6
Energy-related CO_2 emissions (tCO_2/capita) (2017)	15.5	23.3	13.2	44.0	17.9	23.5	5.9	10.5

[a]Years of values: 2015 MENA, and HIC, 2018 for the remaining values.
[b]Years of values: 2014 for Oman, 2015 for KSA, 2012 for Qatar, 2010 for Kuwait, 2016 for the remaining values.
[c]Average value for the world: 11.7; and for Europe and Northern America: 15.2.
Abbreviations: BHR, bahrain; KWT, kuwait; OMN, oman; QAT, qatar; SAU, saudi arabia; ARE, united arab emirates; MENA, middle east and north africa; HIC, High-income countries.
Sources: UN, Stats (unstats.un.org/sdgs/indicators/database/) for the two indices of freshwater withdrawal and domestic material footprint; and Bertelsmann Stiftung and Sustainable Development Solutions Network (2020) for the remaining indices.

TABLE 3 Linking SDG targets to core areas for environmental action in the GCC region.

Core environmental action areas	Directly relevant targets	Closely associated targets	Broad and cross-cutting targets
Sustainable resource use, production, and consumption	Material footprint (8.4.1., 12.2.1), domestic consumption (8.4.1, 12.2.2), sustainable production (2.4.1), solid waste management (11.6.1), sustainable consumption plans (12.1.1), global food loss (12.3.1), recycling rates (12.5.1), water use efficiency (6.4.1), freshwater stress (6.4.2), integrated water management (6.5.1)	Sustainable urbanization (11.3.1), CO_2 emissions intensity (9.4.1), urban air pollution (11.6.2), sustainable tourism jobs (8.9.2), sustainable tourism (12.b.1)	Policy for sustainable development (17.14.1), sustainable public procurement (12.7.1), corporate sustainability reports (12.6.1)
Marine protection and ecosystem management	Degraded land (15.3.1), red list index (15.5.1), invasive alien species (15.8.1), biodiversity planning 15.9.1), water ecosystems (6.6.1), marine (plastic) pollution (14.1.1), marine ecosystem management (14.2.1), ocean acidification (14.3.1), fish stock levels (14.4.1), marine protected areas (14.5.1)	Sustainable urbanization (11.3.1), sustainable tourism jobs (8.9.2), sustainable tourism (12.b.1)	
Climate change, supply security and emergent risks	CO_2 emissions intensity (9.4.1), air pollution deaths (3.9.1), disaster risk reduction (1.5.3, 11.b.2), local disaster risk (1.5.4, 11.b.1), integrated climate policies (13.2.1)	Renewable energies (7.2.1), clean energy investment (7.a.1), urban air pollution (11.6.2)	
Education for sustainable development	Education for sustainable development (4.7.1, 12.7.1), climate change education (13.3.1), climate change capacity-building (13.3.2), research for marine technology (14.a.1)	R&D spending (9.5.1), R&D researchers (9.5.2)	

Marine protection and ecosystem management as recurrent priorities

Another core area for environmental action is represented by SDG targets to preserve ecosystems, particularly marine and water ecosystems, in the GCC region. Marine ecosystems have important cultural and economic values in the region, but they have suffered from coastal construction, land reclamation, plastic pollution, and climate change impacts (Sale et al., 2011). For this reason, expanding and enforcing

TABLE 4 Ecosystem management and climate change in formal policymaking through national visions of GCC states.

Country*	Area	Specific perceptions in national visions	Specific measures in implementation policies of national visions	Environmental ministries
Bahrain	Ecosystem management	No direct mention in 2030 National Vision; a part of the goal of "Conserving our natural spaces for future generations to enjoy (page 22)"	Two goals in National Action Plan 2019–2022: i) activate monitoring of protection of marine areas. ii) Continue to preserve and ensure sustainability of marine resources	Municipalities and agriculture; oil and environment
	Climate change	NA	NA	
Kuwait	Ecosystem management	No explicit mention in New Kuwait 2035	Not a part of projects listed in the Development Plan related to New Kuwait 2035	Ministry of Water, Electricity and Renewable Energies
	Climate change	NA	NA	
Oman	Ecosystem management	A part of the priority "environment and natural resources" in Oman Vision 2040; mentioned within the objective of "environmental ecosystems that are of high quality and free from pollution" as well as implicitly in other objectives (e.g., "balanced environment", "sustainable use of natural resources", "optimal exploitation of the strategic location and biodiversity") within the mentioned priority	Implicit measures mentioned in the 10 h 5-year plan related to environmental awareness and improvements of environmental legislation	Ministry of Agricultural, Fisheries Wealth and Water Resources
	Climate change	Mentioned under the objective "Urban and rural areas and cultural and natural heritage regions that are highly resilient and capable of coping with climate change effects" in the priority "Development of governorates and sustainable cities" of Oman Vision 2040	Repeatedly mentioned in the 10th 5-year plan as a broader challenge to be addressed through environmental objectives related to resource security, circular economy, green economy, awareness, etc.; explicitly mentioned in the measure to "improve protected areas that respond to climate and environmental change and activate early warning systems for natural disasters"	
Qatar	Ecosystem management	Mentioned as a major outcome of "sustainable development" pillar of Qatar National Vision 2030, namely "Preserving and protecting the environment, including air, land, water and biological diversity" through several measures	Measures included in Qatar National Vision 2030 included environmental awareness, environmental institutions, and environmental legislations; several measures mentioned in Qatar's National Development Strategy (2011–2016) including a National Water Act, national biodiversity database, effective management of protected areas, and environmental projects; measures mentioned in Qatar's National Development Strategy (2018–2022) including the development and implementation of a comprehensive coastal marine quality control plan and an integrated plan for protected areas and other ecosystems, the creation biodiversity database, the promotion of environmental awareness	Ministry of Environment and Climate Change
	Climate change	Mentioned as main outcomes within the "sustainable development pillar of Qatar National Vision 2030, namely to" proactive and significant regional role in assessing the impact of climate change and mitigating its negative impacts, especially on countries of the Gulf" and "to Support for international efforts to mitigate the effects of climate change"	Measures mentioned in Qatar's National Development Strategy (2011–2016) including eliminating excess ozone levels through air quality management, halving has flaring; measures mentioned in Qatar's National Development Strategy (2018–2022) including creating an integrated national air quality management plan, and establishing green belt around Doha	
Saudi Arabia	Ecosystem management	Implicitly mentioned in Saudi Vision 2030 under the goal of "achieving environmental sustainability" through aspiration to "preserve environment and natural resources", "reducing all types of pollution" and "rehabilitating beautiful beaches, natural reserves and island"	No explicit programs under the Vision Realization Programs of Saudi Vision 2030; reported in the vision's progress under the Saudi Green Initiative which includes one (of four) targets on "protecting land and sea" through initiatives including establishing and sustainability managing nature reserves, expanding protected areas with integrated management	Minister Of Environment, Water and Agriculture

(Continued on following page)

TABLE 4 (*Continued*) Ecosystem management and climate change in formal policymaking through national visions of GCC states.

Country*	Area	Specific perceptions in national visions	Specific measures in implementation policies of national visions	Environmental ministries
	Climate change	NA	No explicit programs under the Vision Realization Programs of Saudi Vision 2030; reported in the vision's progress under the Saudi Green Initiative under the target of "reducing emissions") through initiatives to capture and use carbon, and energy reforms (e.g., increasing efficiency and introducing renewables)	
United Arab Emirates	Ecosystem management	Mentioned within Target 4.4, "Well-preserved natural environment" of the UAE National Vision 2021 including issues such as environmental protection, environmental awareness, reducing human-induced threats, regulations to defend ecosystems from urban development; implicitly mentioned in Abu Dhabi Economic Vision 2030, within Objective 24 on "environmental sustainability" including environmental compliance	NA	Ministry of Climate Change and Environment
	Climate change	Mentioned within target 4.4. "Well-preserved natural environment" of the UAE National Vision 2021 including issues such as emissions reductions	NA (note)	

NA: Not available. If it was not possible to find any direct or relevant indirect references to the issues of ecosystems management or climate change in the national visions or associated implementation policies/plans.
*The launch years for the national visions indicated in () are as follows: Bahrain National Vision 2030 (2008), Kuwait National Development Plan 2035/New Kuwait (2017), Oman National Vision 2040 (2020), Qatar National Vision 2030 (2008), Saudi Vision 2030 (2016), UAE National Vision/Agenda 2021 (2010).

the protection of ecosystems and adopting comprehensive strategies of ecosystem management are recurrent priorities in the region (Burt et al., 2017). Environmental protection through the designation of protected areas has been an important instrument in the sustainability policies of GCC states (Al-Saidi, 2021). The management of marine ecosystems has also been a recurrent cooperation priority for the wider Gulf region, including all Gulf countries signing the Kuwait Regional Convention for Co-operation on the Protection of the Marine Environment from Pollution of 1983 (Al-Saidi, 2022b). However, these ecosystems have become increasingly affected by urban expansion (including impacts of the disposal of desalination brine), climate change (including fish deaths and coral bleaching), or (plastic) pollution (including coastal tourism activities) (Sale et al., 2011; Ben-Hasan and Christensen, 2019; Paparella et al., 2019; Hosseini et al., 2021).

Table 4 shows how the issues of ecosystem management and climate change are anchored in national visions and their associated implementation policies. The protection of terrestrial and marine ecosystems is a main theme within national policies and is often connected to broader issues such as heritage preservation, environmental awareness, and environmental legislation. With regard to marine ecosystems, GCC states seem to incorporate less specific measures than they do for terrestrial ecosystems. This might be related to the transboundary issues associated with these systems as well as the complex set of challenges facing them. The main proposed instruments to expand the protection of these systems are enhancement of monitoring activities and environmental legislation. Scholars have stressed the need to adopt a comprehensive set of measures towards integrated ecosystem management in the Gulf (Burt et al., 2017). Only Qatar and Saudi Arabia have explicitly incorporated in their national visions the idea of ecosystems management as an all-encompassing approach. The concept of integrated management based on linking different uses and issues of a particular environmental ecosystem is, however, incorporated into several environmental SDG targets (e.g., 6.5.1, 6.6.1 and 14.2.1). Overall, Qatar seems to have the most detailed measures in this area of ecosystem protection and management. However, considering the totality of ambitious measures in Qatar's first and second National Development Plans, progress on these targets is ongoing.

Climate change, supply security, and emergent risks

Climate change is expected to be a major threat in the GCC region, with climate extremes such as heatwaves affecting supply provision, health, and marine ecosystems (Al-Maamary et al., 2017). However, climate change has not featured highly in national policymaking in the GCC, despite GCC states suffering significantly from extremes such as heatwaves, with multiple important impacts, particularly on marine ecosystems (Al-Saidi et al., 2018; Hereher, 2020). GCC states have historically been skeptical to climate change action (Depledge, 2008), rather treating climate action more practically, in terms of expanding renewable energies and modernizing the built infrastructure (Al-Saidi and Elagib, 2018). These modernization efforts include building certifications, investments in public transport, and the expansion of the use of electric vehicles (particularly in the UAE). Investments in renewable energies have also increased significantly in the last decade, with all GCC countries incorporating solar energy in ambitious renewable targets; e.g., 50% of power production by 2030 in Saudi Arabia (by far the largest economy) (Amran et al., 2020; Barhoumi et al., 2020; AlShammari, 2021).

Table 4 shows the incorporation of the climate change issue in the national agendas of GCC countries. Overall, more recent policies seem to incorporate more environmental protection issues than older ones, with the notable exception of Qatar incorporating climate change as a key theme in its 2008 national vision. Qatar's interest in climate change might have increased ahead of hosting the 2012 Conference of Parties (COP 18) of the UN Framework Convention on Climate Change (UNFCCC). After the decline in oil prices in 2013/14, many GCC countries became cautious regarding bold action on climate change (Al-Saidi et al., 2018). Recently, some GCC states (particularly Qatar, Saudi Arabia, and the UAE) seem more engaged with the climate issue, as evident in the establishment of climate change ministries (Qatar and the UAE) or bold climate-related programs (e.g., the Saudi Green Initiative). This can be partly explained through increased interest of these countries in attracting major events or prestigious projects (e.g., Expo 2020 in Dubai, the 2022 World Cup in Qatar, the 2023 COP-28 in the UAE, or major planned cities such as NEOM in Saudi Arabia).

Alongside climate change-related targets, SDG targets related to disaster risk assessment, management and reduction are important due to the mounting risks facing the largely costal supply infrastructure; e.g., desalination and electricity plants, aquaculture, or coastal industry. These risks can stem from industrial accidents, human failure, attacks by non-state actors, or failures due to increased integration of water and energy production through large-scale plants supplying major cities in the GCC region (Al-Saidi and Saliba, 2019). Therefore, SDG targets related to disasters, risks and risk reduction are highly relevant for GCC states. Many of these states have recently shown a strong interest in enhancing their preparedness through strengthening disaster-risk and emergency institutions. However, most of them still lack a broader approach in terms of resilience-based policies, or the adoption of explicit integrated climate policies (SDG 13.2.1).

The missing link of education for sustainable development

Education to increase awareness of sustainable development and climate change has been mentioned in several SDG targets, and it is a key priority for the GCC region as a means of addressing the large ecological footprints, encouraging sustainable consumption, and increasing societal resilience to threats such as climate change. In fact, education for sustainable development (ESD) has been promoted worldwide as a way forward for education establishments (particularly higher education institutions) in order to capture the full benefits of an SDG-driven sustainability transition (Kioupi and Voulvoulis, 2019). The need for enhancing education on sustainability is also mentioned as a priority in national GCC strategies, and it is a common theme in regional policies (Al-Saidi, 2021). There is, however, little knowledge on the current efforts of GCC states to achieve this target, while the GCC's NVRs on the SDGs provide little information in this regard. In GCC states such as Qatar, ESD is still in its early stages and lags behind benchmark countries in the global South, such as Singapore (Fekih Zguir et al., 2021).

In the GCC region, it is rather rare to find specialized higher educational programs on major environmental issues such as natural resources management, climate change, sustainable agriculture, and clean energy. Paradigms such as the knowledge-based economy (KBE) have been used to guide future development. However, the practical focus in the interpretation of this paradigm in the GCC region is to encourage economic sectors with a high added value (hence economic diversification and entrepreneurship) through investing in education in the Science, Technology, Engineering and Mathematics (STEM) fields (S. Aldulaimi et al., 2020; Kayan-Fadlelmula et al., 2022). With environmental awareness arguably low and consumption footprints relatively high, EDS can play an important role for a sustainable future in the region beyond any economization considerations. The SDG agenda also stipulates that ESD should be accompanied by investments in R&D in order to encourage the development of clean technologies. GCC states are increasingly interested in research and innovation investments within their KBE strategies (Wiseman and Anderson, 2012). Considering the political economics of the GCC region, it remains open as to whether this approach based on KBE and mainstreaming elements of the ESD agenda can genuinely produce more sustainable lifestyles and an overall

lower metabolism. Critics argue that mainstreaming the SDG agenda does not challenge the *status quo* and that sustainability education should rather encourage degrowth and environmental ethics (Kopnina, 2020). The SDG agenda also disseminates universal (neoliberal) premises that are often not embraced in Arab or GCC communities through corresponding cultural values that reflect a meaningful sustainability (Al-Zo'by, 2019).

Discussion: Aligning the SDG agenda to national and regional strategies

Mapping the SDGs for the GCC region provides opportunities for policymakers to align their national strategies to the global sustainability agenda and identify future areas for development-related investments. The analysis of SDG priorities for the GCC region allows for some observations to be summarized in this section.

Firstly, GCC states can improve their SDG rankings substantially through action in the highlighted environmental areas. While they seem to underachieve SDG targets in these areas, the mapping exercise has shown that the environmental targets represent the bulk of priority SDG targets for the region. In view of this, one way to implement these targets is to better align the SDG agenda to national strategies. So far, national visions, and particularly more recent ones such as the 2016 Saudi Vision 2030, refer explicitly to environmental action, but they rarely mention global agreements such as the SDGs. By prioritizing and disentangling the SDG targets for the GCC region, states can better link local action to the global targets. For this to happen, GCC countries need to realize the benefits of global environmental agreements such as the SDG agenda. This agenda has been heralded as "transformative" in terms of reflecting and addressing contemporary challenges, in contrast to previous global agendas (e.g., the Millennium Development Goals or MDGs), which focused on the priorities of the developing world (Fukuda-Parr, 2016; Stevens and Kanie, 2016). Embracing such an agenda and linking sectoral policies as well as national ones to global goals can improve the mobilization of funds, cross-sectoral cooperation, and policy impacts (Weitz et al., 2018; Zhan and Santos-Paulino, 2021).

Secondly, for the facilitation of SDG-related environmental actions, GCC states can start with low-hanging fruit such as education, local participation, and awareness of sustainable development, climate change and sustainable consumption. These issues are both separate SDG targets and preconditions for achieving other environmental targets. While this paper has focused on environmental issues, SDG mapping studies from the Arab region (with no study so far from the Gulf region) have emphasized similar soft issues such as participation, empowerment (e.g., through education) and integrated policymaking (Allen et al., 2018; Bissat and Rihan, 2019; ESCWA, 2021). At the same time, more demanding efforts in restructuring GCC economies towards clean production and low-carbon development should be sought in parallel, although the results of these efforts require serious commitments and will take some time to materialize. GCC countries can benefit from a speedier and easier implementation of the SDG agenda since they suffer less from the financial and institutional shortcomings common in order Arab countries. The persistence of diseases, poverty, and lack of expenditure can hinder the attainment of SDGs in other Arab countries, leaving the most vulnerable people behind (El-Zein et al., 2016). In prioritizing action on the SDG agenda, other Arab countries might have to start with the most basic and urgent reforms such as fiscal reform, fighting corruption, and peacebuilding (Bissat and Rihan, 2019). In contrast, GCC countries enjoy well-functioning institutions and economically prosperous societies, but they still lag behind comparable countries on environmental action.

Finally, the notion of environmental action constituting the bulk of SDG priorities in the Gulf region has implications beyond national policies. Many of the highlighted environmental priorities are transboundary by nature; e.g., climate change and related disasters, or the protection of the ecosystems of the Gulf water body. There has been little cooperation on these natural transboundary issues, although there has been success on water pollution in the Gulf (Al-Saidi, 2022b). Transboundary cooperation can increase the resilience of GCC states in facing global change impacts affecting their basic supply securities (Al-Saidi and Saliba, 2019). GCC-wide cooperation has left long legacies and has also covered important areas such as integrated grids, sustainable agriculture, hazardous waste, and (environmental) education (Al-Saidi, 2021). However, this cooperation does not capture the full potential of environmental cooperation on issues such as climate change, energy transition policies, or infrastructure. There are currently plans to enforce this cooperation through, for example, regional climate change research, completing integrated rail networks, and building environmental alliances (e.g., the Green Middle East Summit first held in 2022 in Saudi Arabia). Scholars also call for a wider Gulf region cooperation approach that includes researchers and civil society in order to harness the full benefits of science diplomacy in tackling common environmental challenges (Fawzi et al., 2022).

Conclusion

The SDG agenda represents an important and commonly accepted pillar of the global sustainability agenda. SDG goals and targets are supposed to guide the development agenda of nation states until the year 2030. The SDG agenda is ambitious and comprehensive as it includes a wide range of targets. The monitoring and assessment of progress towards achieving the SDGs have been difficult tasks due to the heterogeneity among the development needs and levels of countries, and the

inadequacy of global comparisons through rankings and indices. Therefore, a prioritization of this agenda at the level of states or relatively homogenous regions such as the GCC region is valuable. The mapping exercise of the SDG targets in the case of GCC states has shown the importance of environmental targets for the region. GCC states seem to be joining the global consensus on major developmental priorities, particularly on SDGs related to clean energy, efficiency in resource use, and low-carbon development. The SDG agenda is an attractive paradigm for GCC states since it is also linked to other global endeavors endorsed by GCC states such as energy transition policies and climate change agreements (e.g., the 2015 Paris agreement).

The core areas for environmental action have been delineated. They include sustainable resource use, sustainable production and consumption, ecosystem protection and management, risk management including climate change, and sustainable development education. By addressing targets in these areas and aligning national strategies to the SDG agenda, GCC states can improve environmental outcomes and their global standings in regard to sustainability. They can immediately target low-hanging fruit such as education and awareness while facilitating demanding actions such as clean or circular production, energy transition, and low-carbon development. Regional cooperation can also accelerate the adoption of a transformative agenda in the GCC based on the SDG accord. Many of the demanding SDG targets demand action beyond national boundaries and beyond the capacity of states to influence outcomes. Global and regional change pressures related to increased resource use, damage to transboundary natural resources, and climate-related extremes require region-wide responses. Increasing research-based cooperation or the inclusion of civil society actors can help improve environmental education and awareness, which represent key missing links in the transition to sustainability in the Gulf region.

The study of the prioritization of SDGs in this paper has relied on explicit referencing of national policies or documented evidence of national relevance provided in the academic literature. Future research can focus on local perceptions on the relevance and merits of the SDG agenda, which, arguably, is little manifested in community-level development practices. The core sustainability values are challenged by the contemporary lifestyles in the Gulf, which often involve consumerism and hence large ecological footprints. Factors influencing a bottom-up transition to sustainability in the Gulf region are largely understudied. Understanding the merits of participatory, multi-stakeholder sustainability approaches in implementing the SDG agenda requires the embracing of single SDG targets and contextualizing the role of non-state actors such as the private sector or civil society. Such future research endeavors can provide a more nuanced view on the reception and acceptance of the SDG agenda in the Gulf.

This paper has shown that the global premise of the SDG agenda (i.e., comprehensive development issues reflecting key challenges involving all countries) can be confirmed in the Gulf region only with regard to the environmental agenda. While the GCC region exhibits a high compliance with many of the economic goals related to basic supply, it still has a long journey ahead in fulfilling core environmental targets. Indeed, environmental SDGs might be quite challenging for the majority (if not all) countries worldwide. This notion underscores the contemporary nature of the SDG agenda. In analyzing how national or regional priorities define the relevance of the SDG agenda, it becomes clear that this agenda has in fact different foci and mini-agendas constituting subsets of highly urgent and highly important targets that correspond to a similar subset of countries. In the example of the Gulf region, the relevant SDG (mini-)agenda is still broad and covers social (e.g., targets related to institutions, equality, and rights), economic (e.g., infrastructure and diversification), and environmental pillars, with the latter at the core of sustainable development priorities in the Gulf region.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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References

Aarthi, S. V., and Sahu, M. (2021). Migration policy in the gulf cooperation Council (GCC) states: A critical analysis. *Contemp. Rev. Middle East* 8, 410–434. doi:10.1177/23477989211028748

Abdel Gelil, I., Howarth, N., and Lanza, A. (2017). *Growth, investment and the low-carbon transition: A view from Saudi Arabia*. Riyadh: King Abdullah Petroleum Studies and Research Center. Available at: https://www.kapsarc.org/research/publications/growth-investment-and-the-low-carbon-transition-a-view-from-saudi-arabia/ (Accessed October 22, 2022).

Abulibdeh, A., Zaidan, E., and Al-Saidi, M. (2019). Development drivers of the water-energy-food nexus in the Gulf Cooperation Council region. *Dev. Pract.* 29, 582–593. doi:10.1080/09614524.2019.1602109

Al-Maamary, H. M., Kazem, H. A., and Chaichan, M. T. (2017). Climate change: The game changer in the gulf cooperation Council region. *Renew. Sustain. Energy Rev.* 76, 555–576. doi:10.1016/j.rser.2017.03.048

Al-Saidi, M. (2019). "Coastal development and climate risk reduction in the Persian/arabian gulf: The case of Qatar," in *Climate change and ocean governance: Politics and policy for threatened seas*. Editor P. G. Harris (Cambridge: Cambridge University Press), 60–74.

Al-Saidi, M. (2021). Cooperation or competition? State environmental relations and the SDGs agenda in the gulf cooperation Council (GCC) region. *Environ. Dev.* 37, 100581. doi:10.1016/j.envdev.2020.100581

Al-Saidi, M., Das, P., and Saadaoui, I. (2021). Circular economy in basic supply: Framing the approach for the water and food sectors of the gulf cooperation Council countries. *Sustain. Prod. Consum.* 27, 1273–1285. doi:10.1016/j.spc.2021.03.004

Al-Saidi, M., and Elagib, N. A. (2018). Ecological modernization and responses for a low-carbon future in the Gulf Cooperation Council countries. *WIREs Clim. Change* 9, e528. doi:10.1002/wcc.528

Al-Saidi, M. (2022a). Energy transition in Saudi Arabia: Giant leap or necessary adjustment for a large carbon economy? *Energy Rep.* 8, 312–318. doi:10.1016/j.egyr.2022.01.015

Al-Saidi, M., Mohammad, S. A., and Awartani, A. N. (2018). "Urban climate change vulnerability, responses, and policies in Qatar: An assessment," in *Handbook of climate change resilience*. Editor W. Leal Filho (Cham: Springer International Publishing), 1–23.

Al-Saidi, M. (2022b). "Regional environmental cooperation: The (lost) potential for a sustainable future in the arabian/Persian gulf," in *The palgrave handbook of positive peace*. Editors K. Standish, H. Devere, A. Suazo, and R. Rafferty (Singapore: Springer), 813–831.

Al-Saidi, M., and Saliba, S. (2019). Water, energy and food supply security in the gulf cooperation Council (GCC) countries—a risk perspective. *Water* 11, 455. doi:10.3390/w11030455

Al-Saidi, M., Zaidan, E., and Hammad, S. (2019). Participation modes and diplomacy of Gulf Cooperation Council (GCC) countries towards the global sustainability agenda. *Dev. Pract.* 29, 545–558. doi:10.1080/09614524.2019.1597017

Al-Zo'by, M. (2019). Culture and the politics of sustainable development in the GCC: Identity between heritage and globalisation. *Dev. Pract.* 29, 559–569. doi:10.1080/09614524.2019.1602110

Alagha, D. I., Hahladakis, J. N., Sayadi, S., and Al-Ghouti, M. A. (2022). Material flow analysis of plastic waste in the gulf co-operation countries (GCC) and the Arabian gulf: Focusing on Qatar. *Sci. Total Environ.* 830, 154745. doi:10.1016/j.scitotenv.2022.154745

Albassam, B. A. (2015). Economic diversification in Saudi Arabia: Myth or reality? *Resour. Policy* 44, 112–117. doi:10.1016/j.resourpol.2015.02.005

Aldulaimi, S., Kharabsheh, R., Al shishany, A., and Alazzawi, A. (2020). "Investment in human capital to promote knowledge-based economy: Data analysis in the GCC," in *2020 international conference on data analytics for business and industry: Way towards a sustainable economy* (IEEE). doi:10.1109/ICDABI51230.2020.9325675

Aleisa, E., and Al-Zubari, W. (2017). Wastewater reuse in the countries of the gulf cooperation Council (GCC): The lost opportunity. *Environ. Monit. Assess.* 189, 553. doi:10.1007/s10661-017-6269-8

Allen, C., Metternicht, G., and Wiedmann, T. (2018). Initial progress in implementing the sustainable development goals (SDGs): A review of evidence from countries. *Sustain. Sci.* 13, 1453–1467. doi:10.1007/s11625-018-0572-3

Allen, C., Nejdawi, R., El-Baba, J., Hamati, K., Metternicht, G., and Wiedmann, T. (2017). Indicator-based assessments of progress towards the sustainable development goals (SDGs): A case study from the Arab region. *Sustain. Sci.* 12, 975–989. doi:10.1007/s11625-017-0437-1

AlShammari, H. (2021). *Saudi Arabia aims to generate 50% of power from renewables by 2030*. Riyadh: Arab News. Available at: https://www.arabnews.com/node/1795406/saudi-arabia (Accessed October 22, 2022).

Ameli, M., Shams Esfandabadi, Z., Sadeghi, S., Ranjbari, M., and Zanetti, M. C. (2022). COVID-19 and Sustainable Development Goals (SDGs): Scenario analysis through fuzzy cognitive map modeling. *Gondwana Res.* doi:10.1016/j.gr.2021.12.014

Amran, Y. A., Amran, Y. M., Alyousef, R., and Alabduljabbar, H. (2020). Renewable and sustainable energy production in Saudi Arabia according to Saudi Vision 2030; Current status and future prospects. *J. Clean. Prod.* 247, 119602. doi:10.1016/j.jclepro.2019.119602

Barhoumi, E. M., Okonkwo, P. C., Zghaibeh, M., Belgacem, I. B., Alkanhal, T. A., Abo-Khalil, A. G., et al. (2020). Renewable energy resources and workforce case study Saudi Arabia: Review and recommendations. *J. Therm. Anal. Calorim.* 141, 221–230. doi:10.1007/s10973-019-09189-2

Basheer, M., Nechifor, V., Calzadilla, A., Ringler, C., Hulme, D., and Harou, J. J. (2022). Balancing national economic policy outcomes for sustainable development. *Nat. Commun.* 13, 5041. doi:10.1038/s41467-022-32415-9

Bellini, E. (2021). *Saudi Arabia's second PV tender draws world record low bid of $0.0104/kWh*. Berlin: PV Magazine. Available at: https://pv-magazine-usa.com/2021/04/12/saudi-arabias-second-pv-tender-draws-world-record-low-bid-of-0-0104-kwh/#:~:text=USA-,Saudi%20Arabia's%20second%20PV%20tender%20draws%20world%20record%20low%20bid,procurement%20scheme%20for%20renewable%20energy (Accessed October 22, 2022).

Ben-Hasan, A., and Christensen, V. (2019). Vulnerability of the marine ecosystem to climate change impacts in the arabian gulf—An urgent need for more research. *Glob. Ecol. Conservation* 17, e00556. doi:10.1016/j.gecco.2019.e00556

Bennich, T., Weitz, N., and Carlsen, H. (2020). Deciphering the scientific literature on SDG interactions: A review and reading guide. *Sci. Total Environ.* 728, 138405. doi:10.1016/j.scitotenv.2020.138405

Bertelsmann Stiftung and Sustainable Development Solutions Network (2017). Sustainable development report 2017: Transformations to achieve the sustainable development goals. Pilot Reference Report.

Bertelsmann Stiftung, and Sustainable Development Solutions Network (2020). Sustainable development report 2020: Transformations to achieve the sustainable development goals. Sustainable Development Report 2020. Cambridge: Cambridge University Press.

Bissat, M. L., and Rihan, C. (2019). Implementing Agenda 2030 in the Arab world: Contextualization, action areas and policy planning. *pse.* 43, 459–476. doi:10.3326/pse.43.4.7

Breuer, A., Janetschek, H., and Malerba, D. (2019). Translating sustainable development goal (SDG) interdependencies into policy advice. *Sustainability* 11, 2092. doi:10.3390/su11072092

Brown, J., Das, P., and Al-Saidi, M. (2018). Sustainable agriculture in the arabian/Persian gulf region utilizing marginal water resources: Making the best of a bad situation. *Sustainability* 10, 1364. doi:10.3390/su10051364

Burt, J. A., Ben-Hamadou, R., Abdel-Moati, M. A., Fanning, L., Kaitibie, S., Al-Jamali, F., et al. (2017). Improving management of future coastal development in Qatar through ecosystem-based management approaches. *Ocean Coast. Manag.* 148, 171–181. doi:10.1016/j.ocecoaman.2017.08.006

Dahim, M. A. (2018). Impact of vision 2030 on traffic safety in Saudi Arabia. *Int. J. Pediatr. Adolesc. Med.* 5, 103–109. doi:10.1016/j.ijpam.2018.08.002

Depledge, J. (2008). Striving for No: Saudi Arabia in the climate change regime. *Glob. Environ. Polit.* 8, 9–35. doi:10.1162/glep.2008.8.4.9

Eissa, M. A., and Elgammal, M. M. (2019). Foreign direct investment determinants in oil exporting countries: Revisiting the role of natural resources. *J. Emerg. Mark. Finance* 19, 33–65. doi:10.1177/0972652719880153

El-Kharouf, F., Al-Qudsi, S., and Obeid, S. (2010). The gulf corporation Council sovereign wealth funds: Are they instruments for economic diversification or political tools? *Asian Econ. Pap.* 9, 124–151. doi:10.1162/asep.2010.9.1.124

El-Zein, A., DeJong, J., Fargues, P., Salti, N., Hanieh, A., and Lackner, H. (2016). Who's been left behind? Why sustainable development goals fail the Arab world. *Lancet* 388, 207–210. doi:10.1016/S0140-6736(15)01312-4

Eppinga, M. B., Mijts, E. N., and Santos, M. J. (2022). Ranking the sustainable development goals: Perceived sustainability priorities in small island states. *Sustain. Sci.* 17, 1537–1556. doi:10.1007/s11625-022-01100-7

ESCWA (2021). Arab sustainable development report 2020. Report.

Fawzi, N. A.-M., Fieseler, C. M., Helmuth, B., Leitão, A., Al-Ainsi, M., Al Mukaimi, M., et al. (2022). Diplomacy for the world's hottest sea. *Science* 376, 1389–1390. doi:10.1126/science.add1555

Fekih Zguir, M., Dubis, S., and Koç, M. (2021). Embedding education for sustainable development (ESD) and SDGs values in curriculum: A comparative review on Qatar, Singapore and New Zealand. *J. Clean. Prod.* 319, 128534. doi:10.1016/j.jclepro.2021.128534

Flamos, A., Roupas, C. V., and Psarras, J. (2013). GCC economies diversification: Still a myth? *Energy Sources, Part B Econ. Plan. Policy* 8, 360–368. doi:10.1080/15567240903515000

Fonseca, L. M., Domingues, J. P., and Dima, A. M. (2020). Mapping the sustainable development goals relationships. *Sustainability* 12, 3359. doi:10.3390/su12083359

Forestier, O., and Kim, R. E. (2020). Cherry-picking the Sustainable Development Goals: Goal prioritization by national governments and implications for global governance. *Sustain. Dev.* 28, 1269–1278. doi:10.1002/sd.2082

Fukuda-Parr, S. (2016). From the Millennium development goals to the sustainable development goals: Shifts in purpose, concept, and politics of global goal setting for development. *Gend. Dev.* 24, 43–52. doi:10.1080/13552074.2016.1145895

Fuso Nerini, F., Tomei, J., To, L. S., Bisaga, I., Parikh, P., Black, M., et al. (2018). Mapping synergies and trade-offs between energy and the sustainable development goals. *Nat. Energy* 3, 10–15. doi:10.1038/s41560-017-0036-5

Gately, D., Al-Yousef, N., and Al-Sheikh, H. M. (2012). The rapid growth of domestic oil consumption in Saudi Arabia and the opportunity cost of oil exports foregone. *Energy Policy* 47, 57–68. doi:10.1016/j.enpol.2012.04.011

Hahladakis, J. N., and Aljabri, H. M. S. (2019). Delineating the plastic waste status in the State of Qatar: Potential opportunities, recovery and recycling routes. *Sci. Total Environ.* 653, 294–299. doi:10.1016/j.scitotenv.2018.10.390

Hepp, P., Somerville, C., and Borisch, B. (2019). Accelerating the united nation's 2030 global agenda: Why prioritization of the gender goal is essential. *Glob. Policy* 10, 677–685. doi:10.1111/1758-5899.12721

Heras-Saizarbitoria, I., Urbieta, L., and Boiral, O. (2022). Organizations' engagement with sustainable development goals: From cherry-picking to SDG-washing? *Corp. Soc. Responsib. Environ. Manag.* 29, 316–328. doi:10.1002/csr.2202

Hereher, M. E. (2020). Assessment of climate change impacts on sea surface temperatures and sea level rise—the arabian gulf. *Climate* 8, 50. doi:10.3390/cli8040050

Hosseini, H., Saadaoui, I., Moheimani, N., Al Saidi, M., Al Jamali, F., Al Jabri, H., et al. (2021). Marine health of the Arabian Gulf: Drivers of pollution and assessment approaches focusing on desalination activities. *Mar. Pollut. Bull.* 164, 112085. doi:10.1016/j.marpolbul.2021.112085

Hvidt, M. (2013). *Economic diversification in GCC countries: Past record and future trends*. London, UK: London School of Economics and Political Science.

Kayan-Fadlelmula, F., Sellami, A., Abdelkader, N., and Umer, S. (2022). A systematic review of STEM education research in the GCC countries: Trends, gaps and barriers. *Int. J. STEM Educ.* 9, 2. doi:10.1186/s40594-021-00319-7

Kioupi, V., and Voulvoulis, N. (2019). Education for sustainable development: A systemic framework for connecting the SDGs to educational outcomes. *Sustainability* 11, 6104. doi:10.3390/su11216104

Kopnina, H. (2020). Education for the future? Critical evaluation of education for sustainable development goals. *J. Environ. Educ.* 51, 280–291. doi:10.1080/00958964.2019.1710444

Krane, J. (2018). Political enablers of energy subsidy reform in Middle Eastern oil exporters. *Nat. Energy* 3, 547–552. doi:10.1038/s41560-018-0113-4

Kroll, C., Warchold, A., and Pradhan, P. (2019). Sustainable Development Goals (SDGs): Are we successful in turning trade-offs into synergies? *Palgrave Commun.* 5, 140. doi:10.1057/s41599-019-0335-5

Mishrif, A. (2018). "Challenges of economic diversification in the GCC countries," in *Economic diversification in the Gulf region, volume II: Comparing global challenges*. Editors A. Mishrif and Y. Al Balushi (Singapore: Springer), 1–19.

Murray, J. Y., and Zhang-Zhang, Y. (2018). Insights on women's labor participation in Gulf Cooperation Council countries. *Bus. Horizons* 61, 711–720. doi:10.1016/j.bushor.2018.04.006

Niftiyev, I. (2021). Dutch disease effects in the Azerbaijan economy: Results of multivariate linear ordinary least squares (OLS) estimations. *HSE. Econ. J.* 25, 309–346. doi:10.17323/1813-8691-2021-25-2-309-346

Niftiyev, I. (2020). Dutch disease symptoms in Azerbaijan economy. *J. Econ. Coop. Dev.* 41, 33–67.

Paparella, F., Xu, C., Vaughan, G. O., and Burt, J. A. (2019). Coral bleaching in the Persian/arabian gulf is modulated by summer winds. *Front. Mar. Sci.* 6, 205. doi:10.3389/fmars.2019.00205

Pirani, S. I., and Arafat, H. A. (2016). Interplay of food security, agriculture and tourism within GCC countries. *Glob. Food Secur.* 9, 1–9. doi:10.1016/j.gfs.2016.05.002

Sadik-Zada, E. R. (2020). Distributional bargaining and the speed of structural change in the petroleum exporting labor surplus economies. *Eur. J. Dev. Res.* 32, 51–98. doi:10.1057/s41287-019-00221-7

Sadik-Zada, E. R., Loewenstein, W., and Hasanli, Y. (2021). Production linkages and dynamic fiscal employment effects of the extractive industries: Input-output and nonlinear ARDL analyses of Azerbaijani economy. *Min. Econ.* 34, 3–18. doi:10.1007/s13563-019-00202-6

Saif, O., Mezher, T., and Arafat, H. A. (2014). Water security in the GCC countries: Challenges and opportunities. *J. Environ. Stud. Sci.* 4, 329–346. doi:10.1007/s13412-014-0178-8

Sale, P. F., Feary, D. A., Burt, J. A., Bauman, A. G., Cavalcante, G. H., Drouillard, K. G., et al. (2011). The growing need for sustainable ecological management of marine communities of the Persian gulf. *AMBIO* 40, 4–17. doi:10.1007/s13280-010-0092-6

Scharfenort, N. (2020). Generating jobs for youth GCC nationals? – tourism development. *Demogr. Change, Labour Mark. Situat. GCC Ctries.* 12, 274–298. doi:10.1515/tw-2020-0017

Sharma, H. B., Vanapalli, K. R., Samal, B., Cheela, V. S., Dubey, B. K., and Bhattacharya, J. (2021). Circular economy approach in solid waste management system to achieve UN-SDGs: Solutions for post-COVID recovery. *Sci. Total Environ.* 800, 149605. doi:10.1016/j.scitotenv.2021.149605

Shulla, K., Voigt, B.-F., Cibian, S., Scandone, G., Martinez, E., Nelkovski, F., et al. (2021). Effects of COVID-19 on the sustainable development goals (SDGs). *Discov. Sustain.* 2, 15. doi:10.1007/s43621-021-00026-x

Stevens, C., and Kanie, N. (2016). The transformative potential of the sustainable development goals (SDGs). *Int. Environ. Agreements.* 16, 393–396. doi:10.1007/s10784-016-9324-y

Weitz, N., Carlsen, H., Nilsson, M., and Skånberg, K. (2018). Towards systemic and contextual priority setting for implementing the 2030 Agenda. *Sustain. Sci.* 13, 531–548. doi:10.1007/s11625-017-0470-0

Wiseman, A. W., and Anderson, E. (2012). ICT-integrated education and national innovation systems in the Gulf Cooperation Council (GCC) countries. *Comput. Educ.* 59, 607–618. doi:10.1016/j.compedu.2012.02.006

Woertz, E. (2013). *Oil for food: The global food crisis and the Middle East*. Oxford, United Kingdom: Oxford University Press.

Yang, S., Zhao, W., Liu, Y., Cherubini, F., Fu, B., and Pereira, P. (2020). Prioritizing sustainable development goals and linking them to ecosystem services: A global expert's knowledge evaluation. *Geogr. Sustain.* 1, 321–330. doi:10.1016/j.geosus.2020.09.004

Zaidan, E., Al-Saidi, M., and Hammad, S. H. (2019). Sustainable development in the Arab world – is the Gulf Cooperation Council (GCC) region fit for the challenge? *Dev. Pract.* 29, 670–681. doi:10.1080/09614524.2019.1628922

Zhan, J. X., and Santos-Paulino, A. U. (2021). Investing in the sustainable development goals: Mobilization, channeling, and impact. *J. Int. Bus. Policy* 4, 166–183. doi:10.1057/s42214-020-00093-3

Zubari, W., Al-Turbak, A., Zahid, W., Al-Ruwis, K., Al-Tkhais, A., Al-Mutaz, I., et al. (2017). An overview of the GCC unified water strategy (2016-2035). *DESALINATION WATER Treat.* 81, 1–18. doi:10.5004/dwt.2017.20864