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Regional institutions' contribution to energy market integration in the middle East

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ABSTRACT

The energy market integration in the Middle East is assessed by comparing the acting institutions in the Levant and Persian Gulf sub-regions. Pami Aalto's regional institution's theoretical framework and the case-oriented comparative research method are adopted for this purpose. Changes in the Levant region coincided with the Arab League's establishment. This league did not develop due to inappropriate bi-lateral energy relationships and a lack of effort among the inter-state trade institutions. Regional institutions, lacking order creation, next to the Arab League members' sovereignty disturb gas transmission, transit, and environmental protection regulations. The Arab League has recognized Israel as an energy-producing member and has reduced the political conflicts' intensity to improve Arabic leadership in the Levant integration. The Persian Gulf states' unilateral trade negotiations, sanctions imposed by the US and EU on Iran's energy sector, and political disputes between Iran and some Arab states prevent coherent regional integration, liberalization, and the launch of joint energy projects. In bi-lateral energy diplomacy competition between the regional great energy powers, Iran and Saudi Arabia outside the region is evident. Though the environmental stewardship institution supports green energy, the profit-interest has priority in these regions. The outcome of this article reveals the existence of constraints imposed on energy market integration in these sub-regions.

1. Introduction

The energy market integration in the Middle East (ME) is assessed based on regional state institutions' cooperation. In the competitive global energy trends, the new energy interconnections, new energy suppliers like renewable energy types, and comparative studies in the energy market are of concern.

The comparative energy market integration, and EU integration, are assessed by Song et al. (2022) where the effect of energy market integration on renewable energy development, based on the panel data of 20 countries in the EU between 2007 and 2019 is evident. They developed a general equilibrium model as to how energy market integration affects expansion concerning renewable energy development. They found that the European energy market integration promoted renewable energy consumption, thus a positive effect in this context. As to the theoretical model, it is estimated that the increase in high fossil energy production costs and strict environmental regulations have increased the need for renewable energy consumption [[1], pp. 1–14].

According to Corona et al. (2021) the wholesale electricity markets in Europe face unwanted changes. The causation of this change is in seeking a major integration plan to develop an internal energy market. In May 2015 a new and complex mechanism was applied in the Central Europe region to manage cross-border capacity allocation in the day-ahead frame market, thus, the Flow-Based Market Coupling, where the recent data of the electricity market to develop a predictive model for identifying convergence and congestion situations are of concern. The occurrence or non-occurrence of convergence, a binary outcome to design a model is of no concern. This model combines meaningful information about the electricity market features of the involved countries from 2016 to 2018, consisting of organized data on renewable energy sources. The primary contributions of Germany and France to the integration process are identified in the estimated coefficients of the model which reveals that the advancing development of solar and wind power in Germany is encouraging in Central Europe. To improve the benefits of market integration and the further development of the Internal Energy market. Their results are promising for policy-makers to issue practical measures for promoting cooperation and coordination among the participants in the electricity market and would allow better power grid

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management in minimizing congestion [[2], pp. 1780–1782].

The major question of how an integrated giant energy market can manage electricity trading through the economies of scale is discussed in Rubanda et al. (2023), where, a systematic presentation of theories and methods are adopted by expert scholars to generate knowledge on integrated electricity markets prevail. The paradigms, concepts, and practices that steam from a unified electricity market theme are detailed to identify the gaps therein. To them, electricity trading in energy market integration can inspire economic integration and access to sustainable energy. Coming up with procedures that would lead to cross-border systems integration without harming the domestic economy would make the energy market integration concept more acceptable [[3], p. 103].

The issue of natural gas market integration in Europe, concerning the initiation of competition and strengthening market connections, next to the move towards hub trading and gas-on-gas pricing is assessed by Broadstock et al. (2020). In their study, the spillovers index introduced by Diebold and Yilmaz is adopted to assess market connectivity between 2005 and 2018. In this process, market connectivity compensates for the deterioration period, by introducing an ascending trend in market integration. The connectivity index peaks are recorded at 65 %. They conclude that the European natural gas market has achieved a non-trivial, level of integration to-date [[4], pp.3-5].

Cassetta et al. (2022) claim that despite the efforts in market integration and harmonized regulatory procedures, heterogeneities in retail electricity prices prevail. The households and industrial end-user electricity prices in the EU between 2008 and 2021 are assessed in the cross-country convergence context. In terms of price convergence, the household and industrial-household markets indicate different trends. Differences across converging institutions are assumed to be related to public intervention in the electricity end-user price setting, disparities within household or industrial consumers range subject to regulated end-user prices, and different criteria applied among countries for defining energy components. In its political sense, the emphasize of institutions convergence analysis is on stronger cooperation and proper public intervention next to related regulations issuance, by considering how end-user price setting can support the decarbonization of the EU electricity systems [5].

Haukala et al. (2021) argue that the European Union (EU) has become a global leader in adopting command-and-control components as instruments for energy transition. These instruments exceed the built-in mechanisms introduced in the 2015 Paris Agreement regarding obligation, prescriptiveness, precision, accountability, and policy control and implementation which contributes to renewable energy interest groups [[6], pp. 88–89].

According to Li (2018), the EU has the most advanced, mature, and free energy markets while its dramatic drop in wholesale energy prices has not translated into a reduction in retail energy prices. The primary restriction in the EU market concerning renewable integration, and the reforms therein is: 1) making the market fit for renewable energy consumption, and 2) setting a practical example of how a competitive economy should be built based on a sustainable and economically feasible energy system [[7], pp. 624–628].

Aalto's "Institutions in European and Asian Energy Markets" are essential in the comparative energy market and EU integration context, where a methodological framework is introduced to compare European and Asian energy markets through a comparative case study on the EU and East Asia. In this article, the operation of the energy market is the structure of institutions, the types and functions of which are of concern. He found that order creating institutions assure sufficient and reasonable stability, mutual trust and solidarity among EU member states in supporting comparative markets institutions. In the East Asian energy markets, the nature of order creating institutions and sovereignty hinder the emergence of supranational formal institutions and a shared idea of trade [[8], p. 92].

Vilela Pinto dos Anjos et al. (2023) assessed the gas market integration and found that after years as a natural gas importer, the development of unconventional gas reserves changed the scenario and the dynamics of the Southern Cone regional gas integration. To assess the contribution of the Argentine gas industry, they adopted the TIMES-ConoSur optimisation model, the regional integration of the gas and electricity systems. Development of the Argentine gas reserves is a game changer, in the regional dynamics and the gas supply to the neighbour countries directly [9].

The international energy markets' system is shaped through regionalization and the need for establishing institutions and integration. To better realize the energy issues in the ME, the political disputes, between cooperation at bi-lateral and multi-lateral levels regarding fossil fuel, electricity, and renewable energy types, must be of concern [10]. Regarding energy market integration and establishment of energy institutions, the studies run on assessing their contribution in facilitating the ME energy market, and the absence of a systematic theoretical framework in analysing these institutions are few. The studies on the centrality of state institutions in the ME economies, the order-creating functions of states for energy market integration, and state sovereignty problems that constrain the ME regional integration are few as well. Consequently, an attempt is made to shed more light on the existing regional institutions' functionality and energy market integration in ME. The analyses here go beyond the political issues. A multi-disciplinary perspective is adopted as a new theoretical framework to assess economic and environmental issues.

According to the available findings, energy market integration is a time-consuming process, that requires strong political support. Liberalization of the national energy markets based on some prerequisites like complete territorial superiority and free of political conflicts is necessary. Establishing an integrated market in the subject regions cannot be without national supervision and regional cooperation subject to price reform agreements, at the bilateral and multilateral level, intra-regional trade, and investment [11,12]. Failure to establish such an institution hinders economic growth in ME countries.

According to Michael Fakhri [13], regional integration among Arab and ME states is one of the primary components of development. The idea of regional trade agreements is assessed and discussed in many studies, where a broader discussion of regional trade agreements and multilateral negotiations is addressed. According to Aalto [14], competition in the energy market integration, in ME, subject to global trends, where Saudi Arabia and Qatar are energy suppliers to Europe and Asian countries is evident.

This competition can lead to regional cooperation among ME countries trade with countries outside the region and initiate an energy dialogue. In this context, Qatar has entered joint ventures with British Liquefied Natural Gas (LNG) companies. No formal energy institution conducts its dialogue. Only the Qatar-European Friendship Association (not an institution) has strengthened these new relationships between the European Parliament the EU, and Qatar [15].

ME depends on exporting different fossil fuel types. According to British Petroleum (BP) statistics, Qatar exported 100.7 bcm of LNG in 2011 and 106.8 bcm in 2021, while, ME LNG export in 2011 was 128 bcm, which grew to 129.7 bcm in 2021, with a global share of 25% [[16, 17,and109]], pp. 34–36]. These figures indicate how the ME regional integration is intertwined with global trends, like the new energy interconnections, and contribute to the related institutions in facilitating the positive outcomes in ME energy market integration.

Next to the lack of regional energy market integration, order creating functions of states vs. firms and state sovereignty must be assessed in depth if bridging some of the existing gaps caused by the centralized state system is sought. To explore the mentioned issues above concerning order creation, transaction costs, and the environment systematically, Pami Aalto's [14] theoretical framework on institutions and energy market integration is adopted in the assessments.

This conceptualization raises the question: *To what extent do these institutions* support *energy market integration in the Levant and the Persian*

Gulf, the two sub-regions of the Middle East?

The oil-exporting countries of the Persian Gulf are Iran and Iraq, and the same who constitute the Gulf Cooperation Council (GCC) are Saudi Arabia, Qatar, the United Arab Emirates (UAE), Kuwait, Oman, and Bahrain, Fig. 1 [18].

The constituent countries of the East Mediterranean (EM) Sea region are Israel, Syria, Lebanon, Jordan, and Palestine. According to Buzan and Weaver [18], Turkey is exempt because it is considered a buffer zone[1] between Europe and Asia. The northern end of the Levant Basin lies near the Syrian port of Tartus and runs down the coastlines of Lebanon, Israel, and the Gaza Strip. The Levant Basin is in the Eastern region of the Mediterranean offshore basin, Fig. 2.

The energy markets consist of crude oil, natural gas, coal, and electricity. In this article, only crude oil and natural gas are of concern.

This article is structured as Aalto's methodological framework regarding Institutions and Energy Market is introduced and discussed in Sec. 2; the results and discussions on the Levant are presented in Sec. 3; the results and discussions on the Persian Gulf and Levant are presented in Sec. 4 and the article is concluded in Sec. 5.

2. Methodological framework: Aalto's regional institutions and energy market

2.1. The study zone

The similarities and dissimilarities among institutions in the Persian Gulf and the Levant, in the energy market integration context, are compared in this article.

A comparative analysis is required for broadening the regional scope and depth of any essential issue. Comparative analysis is subject to the three primary experimental, statistical, and comparative approaches. These approaches follow a deductive trend concerning the conversion of the variables into proper parameters to distinguish the remaining variables' influence. In any comparative approach, based on a preferred strategy, applicable for political and social scientists in assessing different institutions few cases are of concern [[21], pp. 200–215]. The scientific methods and approaches should be adopted, by controlling the hypotheses on the correlations among given variables and keeping the potentially disturbing elements constant.

Comparative approaches are variable-oriented and case-oriented; in the first, the interactions are casual, and in the second, in-depth knowledge of small cases prevails, ending in temporary and limited generalizations. In this comparative article, the case-oriented approach is applied [[21], pp. 216–220].

The subject sub-regions are momentous in their integration prospects and essential in the international energy export trade. The ME sub-regions' energy markets, due to being institutionally complex, are the subjects of this comparative study. Assessing the functionality of these two sub-regions is highly essential in shaping the energy policies of the member countries, a complicated task overshadowed by the existing political conflicts. The gigantic capacity of crude oil and gas reserves in these two sub-regions assure the oil and gas supply to neighboring countries and beyond. This undertaking requires high management regarding energy export contracts and operations coordination in the ME energy markets [22].

Since the 1930s, the ME has emerged as one of the most important energy sources next to being an essential component in global economic stability. A volume of 28,156 oil out of 89,887 thousand barrels per day, and as to natural gas, 714 bcm per annum out of 4037 bcm at the global scale is marketed from this unstable region in 2022 [[23], p. 15 and p. 29]. As to fossil fuel resource magnitude at the global scale, the Persian Gulf is the Mammoth, possessing 65% of oil and 45% of natural gas. Over 50% of the undiscovered reserves of oil and 30% of gas are concentrated in Saudi Arabia, Iran, Iraq, Kuwait, and UAE's natural reservoirs [[24], p. 2].

It sought to determine the enabling, constraining, and institutional features based on an additional logic or building block technique. By assessing each case, a new context is revealed exposing specific features of institutional structures and explaining the integration of the ME energy markets in more detail. The findings here need to be adapted and evaluated in their relevant regional contexts [25].

The Levant region is smaller than the Persian Gulf with fewer regional formal institutions like the Arab Economic Unity, and the Pan-Arab Free Trade Agreement (PAFTA), which represent a more mixed pattern as to their commitment to energy market competition.

Persian Gulf region is big with more regional formal institutions, (to name the most outstanding ones, the Organization of Petroleum Exporting Countries (OPEC) and the Gas Exporting Countries Forum (GECF)) [26,27]. OPEC and GECF member states export oil and gas to European and Asian markets and seek to establish regional energy infrastructures for crude oil, natural gas, renewable energy types, and even nuclear energy projects.

2.2. Types and functionality of the energy industry institutions in ME

According to Aalto's methodology, four institutions are identified in these sub-regions, followed by an inclusive definition introduced by classical institutional economics, international relations (IR) theory, and political practice [8,28]:

In the first institution, the *formal rules and regulations* vary according to their levels: at the high level, *the complicated rules* are well observed, and exercise regulatory or discretionary authority and issue restrictions and at the low level, *the soft rules,* the institutions score lower on any of these criteria, at this level only declarations, joint statements and other documents are issued [[14], p. 3]. The formal rules and regulations both the *complicated* and *soft* rules with their variations attached to the ME energy market are of concern. The official institutions of ME, the OPEC, and GECF in PG are funded based on agreements on energy trade with Asian and European countries. These institutions do not establish an EU-type energy market in ME, Table 1.

In the second institution, the *formal organizations* like state institutions, major regional institutions, corporations, and international financial institution (IFI) subsidiaries constitute the principal initiators and monitors, who enact and enforce rules and regulations. The formal organizations in ME include OPEC and GECF, their affiliated energy corporations, IFI subsidiaries, business lobbies, and related NGOs.

In the third institution, *the conceptual identification of state bureaucracies, corporations, and IFI* subsidiaries *as formal organizational institutions* can be challenged because of the prevailing classical distinction between public and private sectors, while, in the contemporary political economy, state actors are involved in managerial aspects, practices, and decision-making processes. The corporations in energy trade are expanded into state-controlled entities through privatization, public-private partnerships, out-sourcing, and state-linked energy entities who in turn control most fossil fuel resources that have merged in market position capacities and participate in major energy projects as investors. According to Aalto [[8], p. 3], the formal organizations acting as agents undertake technical energy market-related tasks like information compilation, processing consultation, and coordination. Though delegated, these agent institutions with limited authority and capacity to issue obligations are less legalized than their main institutes. Next to their specific mandate(s), they gain expertise through specific market operations, knowing that no formal organization will pool their capacities [[14], p. 3].

In the fourth institution, the three formal institutions above are embedded in a *structure level of informal institutions*. This conception of a nested or hierarchical structure of institutions adopts institutional approaches in some disciplines. For Aalto, informal institutions are the

[1] A neutral area that lies between two or more areas and separates hostile forces.

Fig. 1. The Persian gulf region in the ME
Source [19]:

ones with well-established rules, norms, and practices; they differ from formal institutions because they do not meet the following three legalization criteria: 1) they lack any charter or written format, 2) they operate with low authority and are of weak obligations, and 3) they can impose constraints upon the actors' behavior. These institutions can introduce dependent paths if and when other choices would make an institutional structure resistant to radical change and favor incremental development [[14], p. 3].

Based on this framework, the informal institutions can grow into mega institutions and have their derivatives, which would refer to the variance in how each rule, norm, or practice is followed and realized by the actors. In this context, an informal institution is enriched with energy trade diplomacy and enjoys sovereignty, through great management power and environmental stewardship sub-institutions [[8], p. 3].

The trade-in energy, according to Aalto [[14], p. 3], is highlighted because of its contribution to organizing the actors and coordinating their relations, even if the political power measures indicate that having trade with the opponents is not feasible. Trade in energy markets meets the conditions of conveying standard operating procedures criterion. Aalto believes that trade can be organized at the practical level of inspiring institutions, within competitive markets to corporatist, neo-mercantilist, state capitalist, and developmental, or common market range. As to the informal institutions, regarding energy diplomacy, Aalto [[8], p. 3] defines the practices and norms that seek to balance the security of supply and demand. In the ME, energy diplomacy is state-supervised and facilitated by the regional agents' institutionalized organizations, with members like OPEC and GECF. They organize and set up many bi-lateral and multi-lateral meetings with their European and Asian consumers [29].

The sovereignty institution, according to Aalto [[8], pp. 3–7], depends on the energy resources possession and their operating regulations. The policies of each state in ME focus on securing supply and demand (Global Economy and Development at the Doha Brooking Institution, 2013). To Aalto, the great power management institution refers to order creation and the stabilization of the overall framework of international political economy among the ME great powers. In this context, narrow definitions often entrap these institutions in disputes on energy geopolitics; consequently, in this article, a wider definition is provided as to building informal consensus, applying unlawful decision-making processes, and introducing other networking among ME energy powers [[14], p.3].

Sovereignty is complex even in the EU context with multi-level governance, thus, the argument that multi-level governance does not challenge the sovereignty of states directly. The uni-level aspect of the EU member states is being dissolved gradually into a multi-level policy by their leaders. In a liberal democratic setting, a state executive may wish to shift decision-making to a supranational level because the political benefits outweigh the cost of losing control, while this does not hold for the EU [[30], pp. 372–373].

Environmental stewardship, according to Aalto [[14], p. 7), is

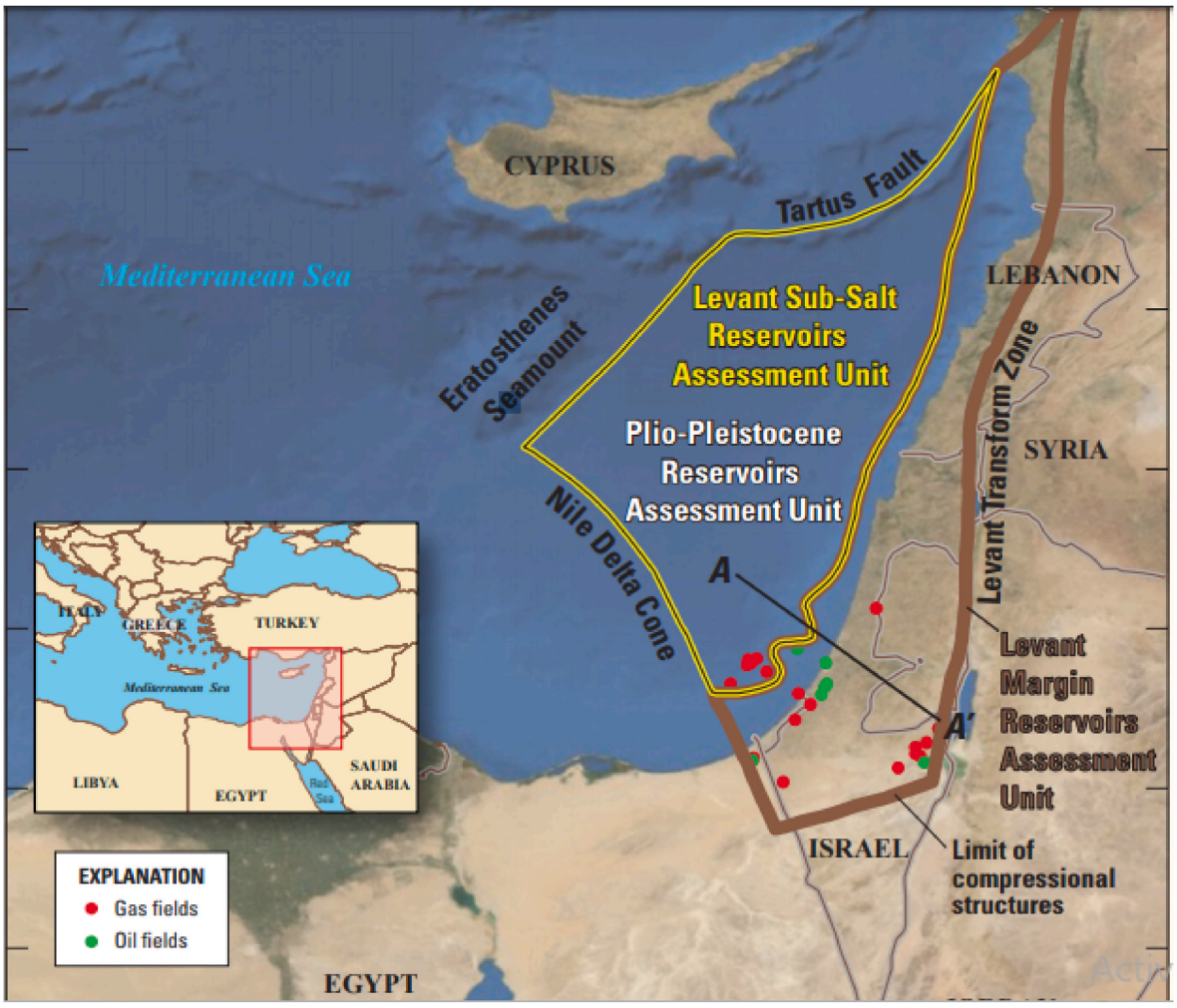


Fig. 2. The Levant Basin region in the EM.
Source [20]:

considered an emerging informal institution in the ME. The formal and informal institutions and their subsidiaries represent the multi-level institutions, through which the institutions of energy markets in the ME are assessed. The multi-level institutions that evolved in the EU have provided a widely applied framework for explaining joint policy-making, which can be generalized to fit other unions [106, pp. 35–37; 107, pp. 20–23].

The term 'multi-level governance' (MLG) emerged from the studies on the EU in the early 1990s, which became a commonly applied aspect of policy-making in the institutional context. In an MLG setup, different actors seek to fill policy gaps through horizontal and vertical informal collaborative ties, to illustrate how the governance system evolves as the power balances change, which leads to developing new path-dependent setups. The collaborative activities of different actors' assessments concerning their institutional concerns and priorities should not be limited to their stated policy goals context and how they seek to achieve them [[31], pp.180-187].

The essence of Aalto's theoretical framework is in its: 1) having a birds-eye view of the details of the state institutions' involvement in regional energy market integration and 2) focusing on order-creating functions of states and other institutions concerning the firms' provision of energy market integration structure. In this theoretical framework, state sovereignty is the major order creating institution in international relations and ME. How sovereignty shapes regional integration in ME, constitutes the primary questions in this context.

The novelties of this article are: 1) applying Aalto's theoretical framework in the ME regions and their energy institutions for the first time, 2) assessing the economic, political, and environmental issues regarding energy infrastructures, interconnections, the political tensions among the member states, the sovereignty right which hampers regional energy order, the CO_2 emissions, and the efforts of the UN and regional institutions adopt policies to reduce air pollution, and 3) the analysis based on multi-disciplinary: economic, political and environmental disciplines' perspective regarding energy institutions in the ME.

By comparing the role and the structure of institutions, concerning ME energy market integration, it is found that, in the subject sub-regions, energy corporations seek energy market integration through their ongoing infrastructure projects. As to market integration, the informal institutions' structure is consequential, indicating that time and resources and formal institutions are required to promote socialization among actors to converge the informal institutions.

The sudden COVID-19 pandemic outbreak, the new phase of the old political tensions between the US and China, with their direct effect on reducing energy integration in the ME, next to finding the original material and sources from economic, political, and environmental studies regarding energy institutions in the ME, fueled by the gradual politicization of the energy market that prevents access to more in-depth data constitute the limitations here. ME is chosen as a case in an institutionally complex system that to a great extent characterizes its energy markets. The energy market-related institutions supervise the member states' contracts for energy exports and hold dialogues with importing neighbors; consequently, the ME energy markets provide a contrasting

Table 1
Regional institutions in ME.

Informal Institutions (Master Derivatives)	Function	Formal Institutions (Formal rules and regulations)	Formal Organizations (actors/agents)
Trade Competition Corporatism	Transaction cost reduction for the exchange of energy commodities and finished products	Free Trade Agreement rules, non-tariff barriers rules, EM Integrated Gas Infrastructure (EMIGI) organization rules, Greater Arab Free Trade Area (GAFTA) rules, EU-GCC trade rules, Intra-PAFTA trade rules, Custom Union rules and regulations, agreements and contracts	Eastern Mediterranean Gas Forum, Delek Energy Group and Modiin Energy Companies, other IFIs
Sovereignty International law Energy law Natural Resources law	Order creation: decisions on the ownership, use, and regulation of energy sources	Charter of the League of the Arab States and OIC: national regulation	ESC Arab League, national energy regulators, and agencies
Energy Diplomacy Bilateralism Multilateralism Security of supply and demand	Order creation and transaction cost reduction: balancing security of supply and demand	OPEC's external energy diplomacies, Doha Declaration, GECF energy diplomacies, ALEUA energy diplomacies, GAFTA, Energy companies	Qatari-European Friendship Association, Qatar and the US MoU, EU-GCC Clean Energy Network, Energy cooperation between ME and other regions,
Great Power Management Balance of power Alliances coalitions	Order creation: Stabilizing a wider framework of international political economy	Arab-Israel peace initiatives, Arab Common Market, Levant, and Persian Gulf states great powers	Bilateral summits and dialogues, ESC and Arab League,
Environmental stewardship Climate Decarbonization Anti-pollution action	Ecological and climatic functions: reducing the side-effects of energy policies	COP21 climate change agreements, UNCCC, EU packages, Kyoto Protocols	Member states, NGOs, INDC, CMP8

Source: Adapted from [[14], p. 4]

case study of regional market integration. The adopted theoretical framework is reliable enough to be applied in other Asian sub-regions. This comparative study would make the ME energy market structures a precedent, with some aspects comparable with other markets. Funded on this 'building block' case study's techniques and the adopted theoretical framework, further case studies may cover broader comparisons.

2.3. Functionality of the institutions

The functionality of the third methodological institutions as to *transaction cost reduction, order creation, and ecological-climatic issues* are assessed.

The transaction cost reduction institutions merely support trade in an informal institution context. The order creating tasks of institutions, according to Aalto, are promising and lead to more agreements that prioritize the transactions. For a successful trade, the establishment of stable and orderly institutions is a must. According to Aalto [[8], p. 5], the order associated with transaction costs, is the core of domestic political science and international order. As to the sub-regions in the ME energy markets, the regional manifestations of international order are essential.

The international order is to sustain and control violence, unlawful agreements issuance, and assure property rights, to promote and regulate the market actors' business conduct, Aalto [[14], p. 5]. The order-creation functions of the regional institutions are expressed within economic actors' demand limits. Due to the difference in sovereign decisions and regulations, and the defection issue in international relations, the regional institutions require strong leadership or high management power [[8], p. 3]. This leadership is evident in the ME energy market, where OPEC is led by Saudi Arabia and Persian Gulf region members, Iran, Kuwait, and the UAE as the official members [32].

Aalto considers a connection between order creation and great power management, where, if the first is sufficient, the regional institutions may face potential state failures due to applying and enforcing collective rational common rules in energy trade and policy.

The side effects of energy production, transport, and consumption usually leave traces on regional environmental issues. These issues are addressed through regional cooperation, even though there exist international measures [[14], p. 3]. According to Aalto [[8], p. 5], the harmful ecological and climatic phenomena, that result from crude oil and gas production, transport, and trade, must be of high concern. Among the environmental NGOs, policy-making institutions like the UN Climate Change bodies assume a significant role.

2.4. Assessing the explanatory model

The similarities and dissimilarities of energy market integration in the subject sub-regions are assessed based on the type and the function of their institutions, and the overall patterns of institutional structures. In this context, the global energy market trends and the order-creation functions of informal institutions have been and are the subject of study and elaboration.

2.5. The applied materials

The material in this study consists of the findings on statistics, and policy briefings in the valuable studies run by EIA, GECF, OPEC, and UN documentations.

3. Result and discussion: institutions in the ME energy market

3.1. Levant region in the EM: trade

The energy authorities of the Levant region met in Cairo at the beginning of 2019 to form an institution named the Eastern Mediterranean Gas Forum to serve the regional gas market, secure the members' interests, assure the supply and demand rates, optimize resource development, rationalize the cost of infrastructure, offer competitive prices, and improve trade relations [33]. This forum would support the Oil and Gas producing countries by enhancing their cooperation with consuming and transitory regional parties. This Forum would assist the consuming countries by securing their demand, developing crude oil and gas policies in the region, and enabling the establishment of a sustainable partnership among the actors in the gas industry [33]. As to the goals proposed by the Forum members, indexes like *liberalization of energy trade, investment, and domestic market, pricing reform, subsidy removal, and interconnecting infrastructure* [34] must be of concern in assessing trade integration.

The member countries in the EM region, as neighboring states, almost ceased their interactions due to the import-substitution strategies of the '70s and '80s, trade investment protectionism, current, and capital

account restrictions, underdeveloped regional infrastructure, and closed borders for political reasons. Though some progress is made as a result of trade liberalization in the '90s, the import tariff rates on manufactured goods are high in most of the mentioned countries, except Israel and Lebanon [35].

The regional states and the EU signed an FTA in 1995, where the tariffs were reduced to some extent, and the non-tariff barriers (NTB) and removal of other obstacles vs. free trade remained almost intact. Upon the gradual conclusion of these agreements, the progress in import tariff reduction is evident. With the highest trade flow with the EU, Israel has removed almost all tariff protection against EU imports and Lebanon has made significant progress with low tariffs applied to EU imports. Syria has the highest tariffs while Jordan and Palestine operate at the intermediate level [35].

The EM regional states are rated the lowest in Foreign Direct Investment (FDI) with 1.11% less Growth in Domestic Product (GDP), compared to other regions between 1995 and 2000. This rating grew and the region recorded one of the highest GDPs, 4.19%, second to that of Central Asia, 4.53%, and the EU, with 4.63% between 2005 and 2009. This growth descended, due to the Arab Spring initiation in 2011, and then followed an ascending trend [36].

Energy trade was not fully liberalized in the EM, because there was: 1) no established market mechanism, to buy and sell natural gas efficiently, and 2) no proper pricing mechanism to determine spot prices. Gas sales are based on the long-term oil indexation price mechanisms' bi-lateral agreements. There exists no deregulated gas market in this region to allow buyers to choose their suppliers. Among the EM regional countries, Lebanon, Israel, Palestine, and Syria face political constraints when seeking to establish a gas market next to the non-existence of intra-trade there [37].

Though in the EM regional states, energy subsidies are somewhat contributive in overcoming economic and social poverty, they impose a fiscal burden on the higher and middle-income stratum. Energy subsidies discourage energy producers from increasing their output improving quality parameters and hamper renewable energy development. Jordan has gradually removed most of her energy subsidies [[36], p. 3] on petroleum products, for household consumption, which led to a 14 to 33% increase in petroleum prices [38].

Interconnection of the infrastructures is made through the EM Integrated Gas Infrastructure (EMIGI) organization, which would allow common projects to be executed in the region. These infrastructures include the Arab Gas, the El-Arish Ashqeklan, and the *Trans*-Arab Pipelines. These interconnected infrastructures require simple, efficient design and cost-effective implementation, subject to economic feasibility tests. The EMIGI would reflect the supply and demand profile of its member countries' infrastructure, where the export destinations indicate that the existing political and financial risks in the region are reduced and the international investors have become interested [39].

In most of the EM member countries, the competitive market is hampered by state institutions and state-owned energy corporations like the Delek Energy Group and Modiin Energy Companies in Israel. The percentage of Levant fossil fuel exports and imports trade are bar charted in Fig. 3, where, as observed, the Levant region countries are import pivotal.

3.2. Levant region in the EM: Energy diplomacy

The regional economic integration began in 1957 upon the formation of the Arab League's Economic Unity Agreement (ALEUA), with the outlook to establish an Arabic Common Market. The ALEUA held a meeting in Cairo, in June 1964, to administer and supervise its operations. The initial members of ALEUA consist of Jordan, Palestine, and Syria. This union was based on economic and energy diplomacies in promoting investment and trade among the Arab states to develop their resources and flourish the economy [40,41, and 42].

ALEUA failed to accomplish its objectives; consequently, in 1998, its members established the Pan-Arab Free Trade Agreement (PAFTA) to coordinate the tariffs' policies, stimulate inter-member and global trade, and coordinate tax and duty legislation. PAFTA with all its annual Ministerial meetings due to economic and political disagreements therein has not shown any tangible progress on its energy objectives [43].

The economic and social council (ESC) of the Arab League is an institution that coordinates energy diplomacy through economic integration. In February 1997, the ESC agreed on procedures that would facilitate and develop trade among Arab countries. The issues of economic and social development were addressed in the ESC two summits agenda, held at the heads of state level between 2009 and 2019. The first summit was held after the Gaza War in 2009. In the second summit on energy sustainability, based on the approved Arab Renewable Energy Applications Development Strategy adopted in the 2013 Summit, the Arab Renewable Energy Framework, and its portfolio was converted into a Pan-Arab collaborative framework to enhance energy production from renewable sources [44].

Arab countries mostly rely on bi-lateral connections, each constructing its portion of the regional infrastructure, and this reliance is intensified due to the decades-old disputes between Israel and Palestine and the newly initiated civil war in Syria. The external dimensions of the Arab League's ESC and other Arab Mediterranean Union's energy diplomacy consist of EU countries and the UN agencies, global and regional organizations involved in programs like renewable energy, energy efficiency, and Carbone capture [45].

The ESC's League of Arab States seeks economic integration and energy development, and administers the GAFTA member states; though

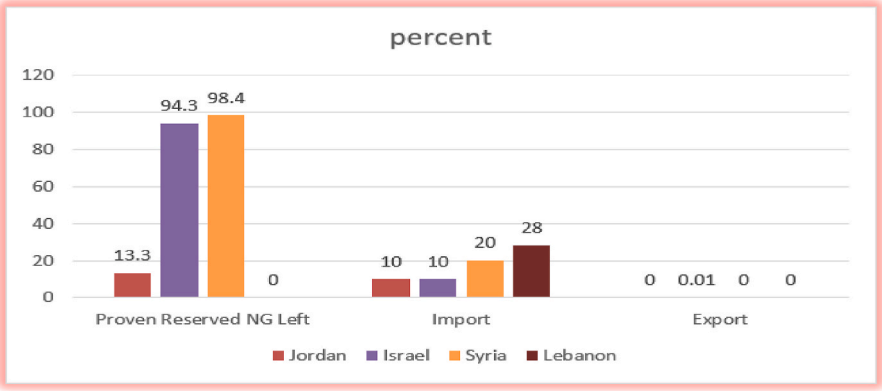


Fig. 3. Levant crude oil and gas import and export in 2021.
Source: [97, p.2; 98, p. 1]

they do not support the existing measures, and bilateral energy diplomacy which has a significant role vs. the new energy contractors and establishing new upstream infrastructure, GAFTA is not effective in reducing transaction costs [46]. The bi-lateral approach mainly fits the ESC trade integration measures, and multi-lateral energy diplomacy, and persists on Gaza Marine gas field exploitation, which would generate revenues, and reduce political tensions between Palestine and Israel, next to prioritizing the energy export to neighboring countries. In this context, a Letter of Intent was signed by Jordan to import 1.5–1.8 bcm of fossil fuel annually from Palestine [47].

Trust building among the EM countries and solving the major political disputes among Israel and Palestine, Israel and Syria, Israel and Lebanon would increase the multi-lateral negotiations and reduce the chances of the bi-lateral negotiations regarding regional order creation [[8], p. 5].

3.3. Levant region in the EM: sovereignty

One of the major constraints of the ESC Arab League's energy diplomacy in order creation in the region is the member states' policy autonomy and the diversity inherent in the political tensions. In the Arab States League's Charter, the following statement is outstanding:

> The league has its purpose of strengthening the relations between the member states, coordinating their policies to achieve cooperation and assure their independence and sovereignty, with a focus on the tariffs and interests of the Arab countries [48].

Though each member is sovereign, its decisions are based on the consensus and interests of the member states in confronting the strong formal enforcement mechanisms [[48], p. 2]. This Charter and ESC concentrate on the harmonization of standards and regulations, while, according to the sovereignty of Arab League states Israel is exempt. The sovereignty constraints impose a limit on upstream infrastructure projects in the Levant region. The Gaza marine off-shore gas field is 36 km off the Gaza Coast which is not properly developed due to political, economic, and regional disputes. Upon solving Palestine's maritime borders problem with Israel, Israel would join the Arab League [49].

Exporting natural gas from the Leviathan gas fields of Israel to Jordan in 2020 is pending because Jordon announced in 2018 that it would not extend the land lease to Israel on her border, although this issue is a part of the 1994 Jordan-Israel peace agreement [50].

The unresolved issues concerning the off-shore boundaries between Israel and Lebanon constitute another major constraint in the development of energy resources in this region. This issue has a long history rich in conflicts and military confrontations [51].

National sovereignty problems in the Levant region consist of border issues, transit, distribution regulations, environmental protection, and safety. Regional institutions like the ESC must harmonize the standard regulations in energy trade in this region [52]. This harmonization can be accomplished provided that, there exists mutual respect among the states and institutions therein. The advantages of harmonization could serve as an incentive for the regional states while encouraging independent investors. The regional states could benefit from sovereignty, and the inter-governmental approved technical cooperation [53].

3.4. Levant region in the EM: Great power management

Arab League's SEC and Arab Economic Unity engulf Arab member states.

The inter-regional political and energy disputes among the member states, between Israel and Palestine specifically, hamper regional order creation in the Levant region [54]. The Arab states believe Israel seeks to create order in the region with political orientation, the US supports and deploying nuclear arsenals, but so far has failed to enact the same in the energy market integration [55].

If the order creation capacity is compared today with the institutional establishment beginning in the 50s, it will show an increase in the count of inter-state conflicts. The contribution of Arab institutions like the ESC and Arab League in mediating without violating state independence and sovereignty indicates that the orientation of these two institutions is consensus-based, non-intervention policies and economic integration. There is doubt whether the Arabian institutions can actuate the regional order creation or lack leadership in enforcing the regional economic integration of energy [56].

The ESC in the Arab League has paved the way for the private and banking sectors to participate in the Arab Customs Union establishment, promoting education and science, and extending the Arab Common Market. According to the Kuwait News Agency [57], one of the resolutions of the ESC in 2009 requires the national financial institutions to contribute to the stability of the global financial situation, the energy trade in particular. The ESC and the Arab League status next to not being threatening are involved in order creation [58].

3.5. Levant region in the EM: Environmental stewardship

Climate and environmental issues are of high concern in the ESC in the Arab League. The ESC's summit in Riyadh, in 2013, adopted the Arab Renewable Energy Framework (AREF) to establish a Pan-Arab collaborative network to enhance energy production from renewable sources. The National Renewable Energy Action Plan (NREAP) in the Arab region is another institution involved in national renewable energy planning. The objective of NREAP is to assure the development of renewable energy plans in Arab countries [59]. The Arab Ministerial Council for Electricity, Environment, and Climate operates according to the League of Arab States directives with a focus on renewable energy types, their efficiency, and reducing CO_2 emissions [60].

The emitted CO_2 from burning fossil fuel types is due to human energy consumption. The gas types that trap heat in the atmosphere contain carbon dioxide, methane, nitrogen oxides, and nitrous oxide are labeled as the greenhouse gas (GHG), expressed in CO_2 eqv/capita. Climate change is caused by GHG accumulation, which, in turn, over-insulates the planet, thus, the temperature rise [[61], p. 1].

As observed in Fig. 4, radiative forcing is expressed in watts/m^2, representing the energy imbalance velocity in the atmosphere. On the right side of the graph, radiative forcing is converted into the Annual GHG Index, 1.0 for 1990 but 1.49 for 2022 [[62], p. 3].

The European Commission Statistics reveal that the share of CO_2 emission in the Levant region is on the rise. The Palestine and Israel share was 7.8 of the total CO_2 emissions (tonnes of CO_2 per capita) in 1990, which reached 8.04 tons in 2017 [63]. The basic renewable energy prediction and carbon capture technologies are not up to par, and renewable energy corporations encounter high investment costs and a complex legal framework [64,65]. More updated information is tabulated in Table 2.

The details of the analyses are tabulated in Table 3.

4. The Persian Gulf Region

4.1. Persian Gulf region: trade

Trade integration in this region is becoming more formalized. Iran's economy and the energy sector are subject to heavy sanctions by the US and the EU. The GCC members are affiliated with the Greater Arab Free Trade Area (GAFTA) and seek to marginalize Iran in this market. The GCC members pursue greater integration through Free Trade Agreements (FTA) and investment agreements. Although a committee of energy is established in GAFTA, the energy market measures are not established yet [66].

The efforts made by the GCC in initiating collective trade negotiations face constraints, while, most of its members are engaged in unilateral external energy trade negotiations with the EU, Australia, New Zealand, India, Korea, Japan, and the US through the FTA. The inter-

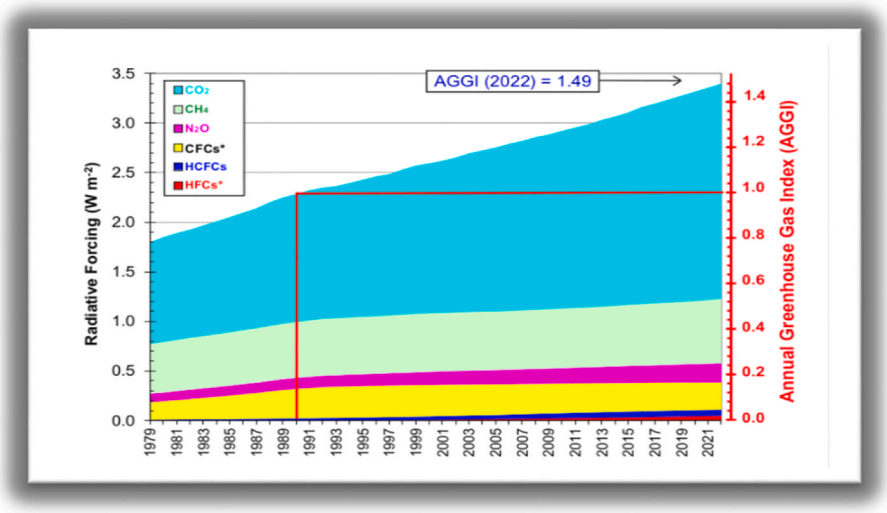


Fig. 4. Different greenhouse gases caused global Warming between 1990 and 2022.
Source: [[62], p. 2].

Table 2
Total CO_2 Emission in the Countries of the Levant Region: tonnes of CO_2 per capita.

	Israel and Palestine	Jordan	Lebanon	Syria
1990	7.84	2.87	2.21	2.65
2017	8.04	2.53	3.80	1.55
2019	7.9	2.81	4.5	1.57

Source: [[65], pp. 120–130]

organizational negotiations in GCC are not promising for establishing a common package of interest and status. This drawback, due to a lack of both political will and weak administrative capacity is reflected in the limited collective decisions enforcement on external trade relations [67]. The percentage of the Persian Gulf fossil fuel exports and imports trade is bar charted in Fig. 5.

According to these bar charts, the Persian Gulf countries similar to the Levant members are export pivotal; consequently, Persian Gulf countries have an important role in energy export. As observed in Tables 4 and 5, the tabulated statistics confirm the export pivotal nature of ME (see Table 6).

Among the many initiatives, the GCC and China have established an economic and political consultation mechanism to coordinate their mutual interests, which has led to the signing of the Economy, Trade, Investment, and Technology Cooperation Framework Agreement in 2004, thus, the formation of the GCC-China FTA. One of the primary diplomatic mechanisms in promoting the FTA was the GCC-China strategic dialogue. The importance of this FTA is in the Belt and Road Initiative feature that promotes cooperation in policy coordination and facilitates connectivity, undisturbed trade, and financial integration [71].

The EU-GCC introduced and launched an FTA in 1990 to liberalize the trade, which lasted only 18 years, while, the EU-GCC trade experienced fast growth beginning in 2006 and ending in 2016, with a 53% increase including the gas price rise in 2013. The EU, with 14.6% of its total trade, was the first trading partner for the GCC in 2018 [72].

By resorting to the same indexes applied in the Levant, some regional energy market integration is observed in the Persian Gulf but is yet to become close to that of the EU. The GCC states are active members of PAFTA, supported by the Arab League, where the main provisions consist of the removal of tariffs and non-tariff barriers in Intra-PAFTA trade on commodities. In 2010, the PAFTA members sought to extend integration to encompass trade and investment in services and to strengthen efforts in reducing the non-tariff trade restrictions. PAFTA has removed tariffs from its members, thus, to an increase in trade among the GCC states. The non-tariff barriers are constant and pose a major obstacle to greater trade integration between the GCC and other PAFTA members [[67], p. v].

Table 3
The list of institutions in the Levant Energy Market.

Trade	Diplomacy	Sovereignty	Great power Management	Environmental Stewardship
- **The important role of the EM Gas Forum** - **Interconnecting energy infrastructure through EMIGI** - **Efforts to reduce tariffs** - **Progress in import tariffs reduction** - **Israel's efforts to remove EU import tariffs** - **Levant countries and the lowest rate of FDI** - **Not full energy trade liberalization** - **Energy subsidies rate in the regional countries** - **Domination of state-owned energy companies and low competition**	- the important role of ALEUA - PAFTA's role in coordinating tariff policies - ESC coordination for energy diplomacy - Bi-lateral diplomacy - ESC's efforts for economic integration	- Efforts for regional order - Sovereignty constraints like border issues, transits, etc. - ESC's efforts for regulations and harmonization of standards - Frequency of political disputes in the region - Israel-Lebanon off-shore boundaries disputes	- Political disputes hampering regional order - Israel's efforts to create regional political order - ESC'S efforts for establishing the Arab Customs Union	- ESC's concern on climate and environmental issues - AREF FORMING Pan-Arab Collaborative framework - NREAP's establishment of national renewable energy planning - CO_2 emissions rise in the Levant

Table designed by the authors.

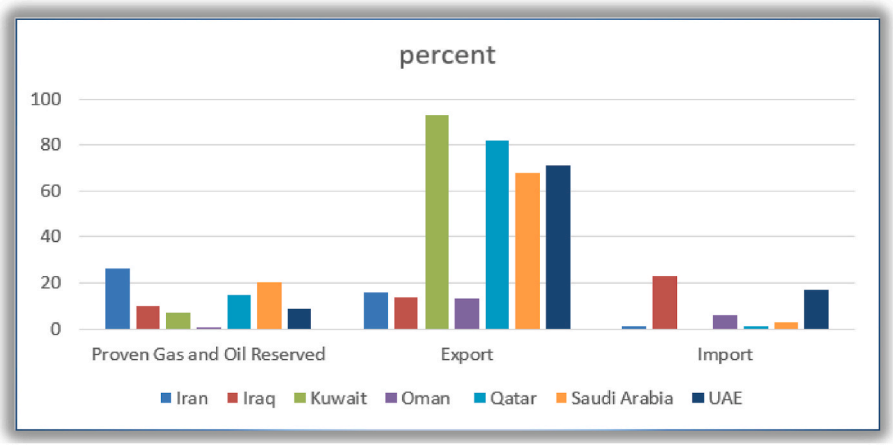


Fig. 5. Persian gulf oil and gas exports and imports trade in 2021.
Source: [[68], p.2; [69], pp. 16–42]

Table 4
ME natural gas export (bcm).

	2010	2012	2014	2016	2018	2020
Pipeline Export	8.2	9.0	9.3	8.0	8.8	7.7
LNG Export	103.8	130.3	132.3	126.0	125.9	126.9
Total Export in ME	112.0	139.3	141.5	133.9	134.8	134.6

Source [58,68]

The Custom Union established in 2003 in the GCC seeks to remove restrictions on internal trade and common external tariffs. Tariffs vary by a minimum of 40% in domestic added value and 51% in domestic investment [73]. The absence of an agreed-upon mechanism to collect and distribute tariff revenues has undermined the establishment of a standard Custom Union. Custom inspections are common among the GCC members, but they apply some restrictive measures and standards in this process, which interrupts free trade [74].

The GCC external tariffs are low because of their sizable energy wealth and low production base. Signing the Custom Union Agreement introduced a common external tariff of 5% on most imported commodities and 0% on essential commodities. In the GCC states, the Most Favored Nation (MFN) ranking dropped from 8.2% during 2000–4 to 6% during 2006–2009, due to the varying tariff rates of GCC countries based on the differences in protective and preferential tariffs [[74], p.17]. Iran, as a member of the Persian Gulf region, is exempted from the GCC.

4.2. *Persian Gulf region: Energy diplomacy*

The initiation of energy integration and energy diplomacy in the Persian Gulf coincides with the establishment of OPEC at the Baghdad

Table 5
The summary of Energy Production, Consumption, and Trade Patterns in the Levant and Persian Gulf Regions (oil p/1000 Br. p/day and Gas p/bcm.

	Production in 2011	Production in 2021	Consumption in 2011	Consumption in 2021	Trade Movements in 2011 (ex.)	Trade Movements in 2021 (ex.)
Levant Oil	554	287	735	502	0.001	0.01
Persian Gulf Oil	27,453	27,869	7377	8138	18,125	16,735
ME Oil	28,007	28,156	8112	8640	20,308	21,770
Levant Natural Gas	4.2	17.9	22.1	24.3	0.001	0.01
Persian Gulf Natural Gas	515.8	697.1	376.4	551.2	129	135
ME Natural Gas	520	715	398.5	575.4	138	143.1

Source: [[23], pp. 36, 37, 15, 20, 28, 29, 31]

Table 6
The cross-border pipelines in the Persian gulf region.

	Project Name	Start Point	End Point	Diameter (inches)	Length (km)	Capacity (1000 b/d)
Iran-India	–	Bandar e-Abbas	Fazilka	–	–	–
Iraq-Syria	Banais Line	Hadithah	Banias	12, 16	890	1400
Iraq-Kuwait	–	Rumaila	Kuwait City	170	–	–
Iraq-Israel	Haifa Line	Hadithah	Haifa	100	–	–
Iraq-Turkey	Dorytol Line	Kirkuk	Dorytol	40	1040	1000
Iraq-Saudi Arabia	Iraqi Line Phase 1	Zubair	Yanbu	56	626	500
Jordan-Syria	Arab Gas Pipeline (AGP)	Rehab	Homs	–	–	–
Kuwait-Saudi Arabia	–	Hout Field	Ras Al Khafji	24	20	–
Qatar-Oman	Dolphin Gas Project	Ras Laffan	Sohar		1280	–
Saudi-Arabia-Bahrain	Dhahran	Sitra		2 × 12, 18, 22	42	–
Saudi-Arabia-Lebanon	–	Dhahran	Sidon	30, 32	1200	500

Source: [[70], p. 3]

conference in September 1960, set by Iran, Iraq, Kuwait, Saudi Arabia, and Venezuela [29].

OPEC has established inter-state regulations in the energy sector and the global oil market. OPEC has coordinated energy diplomacy among its members and energy customers for economic integration and high profits. This diplomacy is consistent with the remarks made by the former OPEC Secretary-General, Alvaro Silva-Calderon in the 3rd Russian Oil Gas Week on November 5, 2003:

> It is interesting to see that the organizers have linked cooperation with the development of energy diplomacy because, in OPEC, we cannot imagine any kind of effective diplomacy without cooperation [75].

The focus of OPEC members is on stable energy markets, sustainable development, and environmental protection issues as the three major themes, and adopting a long-term strategy in 2005. In mid-2008 crude oil, prices soared to record-high levels before the global financial crisis. OPEC members became prominent in supporting the oil sector. From 2008 to 2011 the financial problems made an obstacle for oil prices which faded between 2011 and 2014 before the second shock in 2014. OPEC continued to seek stability in the market and expanded its diplomacy and cooperation with its members and customers [76].

The internal diplomacy of each OPEC member weakened its performance because of their different perspectives on 1) the Iraq-US war in 2003, 2) the increased tension between Israel and Palestine, 3) the Israeli-Lebanese-Syrian conflicts, 4) the tensions between GCC and Iran, and 5) Daesh activities [77]. The external energy diplomacies of OPEC are strong in comparison with other major oil exporters like Russia, and Norway, and the countries on the list of great oil importers like China and India [78].

The GECF is duty-bound to the greatest natural gas producers in the Persian Gulf. Iran and Qatar are the holders of the major gas reserves. The GECF members are endowed with 70% of the global gas reserves, 85% of which is traded through pipeline networks and 15% as LNG by sea vessels [79]. GECF was established through common energy diplomacy among Russia, Iran, and Qatar in 2001. In the beginning, there was neither a charter nor a membership structure. The charter of this trio was adopted in 2008, in the ministerial meetings, since its establishment, the natural gas prices and a common approach towards the gas market were the primary issues of discussion in their summits since 2010 [[79], p. 2]. According to the Doha Declaration, the members recognize the importance of long-term gas contracts in achieving a balanced risk-sharing mechanism between producers and consumers [80].

Unlike OPEC, the GECF's price mechanism and gas market emerged and the members benefitted from running bi-lateral energy diplomacy with other institutions outside the region, (i.e., the Qatari-European Friendship Association formed in 2012). They have developed financial and energy organizations to establish trade cooperation and make investments [81]. Qatar and the US signed an MoU in 2018 for cooperation in the energy market [82]. Iran initiated negotiations with the EU in 2015 and still requires advanced diplomatic procedures to win. Iran has participated in meetings and conferences with European states, policymakers, and scholars, and signed MoUs, (i.e., Mohammad Reza Yusefipour, head of NIGC public relations, signed an MoU with IBS Corporation, Germany, intending to push down the accident occurrence rate in the risky industry of natural gas to zero) [83].

The diplomatic relations of GCC with other institutions are vital, (i.e. EU-GCC Clean Energy Network develops cooperative activities on clean energy including policy and technology among the EU and GCC) because discussions are run on specific cooperation packages like Renewable Energy Resources, Energy Demand Side Management, Energy Efficiency, Clean Natural Gas, Carbon Capture and Storage [84].

As to diplomacy, with all the measures and approaches at hand, the energy integration in the ME, and the Persian Gulf regions are affected by the trade relationships with great Asian powers, China and Russia. China avoids entanglement in the ME energy market. China's ever-expanding economic interests and high volume of energy demand from the ME have forced it to acquire a customized diplomatic stance. This region is important to China's Belt and Road Initiative, where the Chinese government has to assure that its investments in the Saudi Arabia energy sector are not threatened by Houthi missiles. China is expanding its economic presence in Iran and is interested in supporting Russia's plan with Iran regarding the potential transit corridor that would allow Russian trade to reach global markets through the Persian Gulf by bypassing the Suez Canal. This corridor if opened would allow China to circumvent the Strait of Malacca, where the US and its allies are building a powerful squadron. To advance its strategic priorities in its diplomatic sense, China is preparing to challenge the US for its influence in the ME. The convergence of the broader strategic interests of China, Iran, and Saudi Arabia, most probably could serve as the launching pad for a new geopolitical reality in the ME, a serious challenge for the US [85].

China relies on its engagement in the Persian Gulf region by establishing closer energy and economic ties with Iran and Saudi Arabia. As to the mediation, China's economic diplomacy is new and direct concerning the ME's political contentions [86].

China's power and influence next to its constant foreign expansion policy are becoming more evident. Russia is tightening its relations with China, specifically on energy trade. The long-term energy contract(s) drawn between these two countries' energy sectors will allow high volumes of LNG supply to China. Russia is acquiring the characteristics of a great power in Asia. Iran has favorable relationships with these two new global emerging powers. Upon the US withdrawal from Afghanistan in 2021, China has increased its influence in the Indo-Pacific region. Stability in Afghanistan implies stability in Iran and Pakistan because China has heavy investments there [87].

4.3. Persian Gulf region: sovereignty

This institution, in the Persian Gulf region, highlights territorial integrity and political self-determination. Saudi Arabia and Iran, the two great regional powers who support the Organization of Islamic Cooperation (OIC), at the same time, support Islamic integration and respect each member state's sovereignty:

> OIC respects the right of self-determination and co-interference in domestic affairs, as to the sovereignty, independence, and territorial integrity of each member state [88].

Concerning the Big Tunb, Small Tunb, and Abu Musa Islands, offshore territorial disputes prevail between Iran and the UAE [89]. Among the GCC members, Saudi Arabia and Qatar have entered a pact against Iran. This sovereignty-threatening constraint hampers the creation of regional order in the Persian Gulf, where, the GCC Supreme Council insists on the importance of respect for its member states' sovereignty, especially that of the UAE on the three subject Islands [90].

The states of the Persian Gulf, endowed with rich energy resources, prefer the neo-mercantilist approach, state-led resource policy, and sovereign control over external supply networks [91,92].

The GCC states and Iran depend on foreign energy corporations' new technologies and investments. In this context, Qatar Gas Corporation II developed the LNG infrastructure of trains IV and V with over 40 technological innovations in advanced equipment and systems worth £3 million in joint ventures with ExxonMobil and Total corporations [93]. Iran has entered joint ventures with European and Chinese corporations. The negotiations between Iran and the 5 + 1 Group (i.e., Iran and Belgium were negotiating for developing moored units, a floating LNG production unit, at Kharg Island vicinity atop offshore gas fields for liquefying the supply for onward shipments) ceased when more sanctions were imposed on Iran's energy sector [94].

Sovereignty becomes problematic in energy projects when regulations differ between the host countries and investors. The regional states seek to reduce transaction costs, while there is no coherent regional

coordination and common policy in the Persian Gulf region. Except for Iran, the other GCC members have different trade criteria and each protects its interests.

4.4. Persian Gulf region: Great power management

The Persian Gulf's great energy powers, Iran, Saudi Arabia, and Iraq, each have its unique management structure in different capacities.

Iran's proven natural gas was 34,000 bcm in 2014 and 32,000 bcm in 2019 [[95], p. 20; 9, 20–22]. Saudi Arabia with 18% of global proven crude oil reserves is the greatest oil exporter. Her oil trade accounts for 50% of her GDP and 70% of her export revenues [96–99].

Iraq is ranked second in crude oil production and export in OPEC after Saudi Arabia. Iraq's oil production increased up to 300,000 barrels per day beginning in 2013 and reached 4.4 million in 2017. During the first half of 2018, Iraq's oil revenues were $4.5 billion [100]. Oil and natural gas pipelines in the region have had an important role in inter- and intra-regional interconnections. Iran leads the ME in terms of oil and gas trunk and transmission pipeline length extension from 2022 to 2026. Natural gas pipelines account for almost the entire pipeline length extension by 2026 in the country. Iran's Gas Trunk Line (IGTL) XI is the major upcoming pipeline to be installed at 1200 km for natural gas transfer. Iran accounts for 35% of the total active (operational) trunk and transmission pipeline length in the ME with more than 90 pipelines. Being one of the leading producers of oil and gas in the region Iran has built a strong transmission pipeline network. Iran plans to install gas and petroleum product pipelines to meet export requirements. Saudi Arabia has about 15% of the ME's operational pipelines with 84 pipelines. Saudi Arabia would extend the pipeline length of 1559 km from seven planned and announced projects from 2022 to 2026. Iraq has 11% of ME's operational pipelines, 17 pipelines. A total of three planned and announced projects are expected to extend the pipeline length by 358 km from 2022 to 2026, for exporting purposes. The UAE with 7% followed by Oman and Qatar with 6% and 4% hold the other rankings, respectively. The last three countries are planning to add 9 pipelines of 2249 km collectively [[70], p. 2]. The details of the cross-border pipelines in the Persian Gulf region are tabulated in Table 6.

As to the demand-side leadership, Qatar is one of the smallest countries in the Persian Gulf region with 24,700 bcm of proven natural gas resources (see Table 7). Qatar's production of 171.4 bcm in 2013, increased to 178.1 bcm in 2020 [[22], pp. 20–22]. Qatar is the third greatest natural gas producer and covers most of the Asian and European gas markets [[74], p. 6]. Next to being an energy supply power, Qatar has emerged as one of the proactive mediators for Lebanon and Sudan in recent years by exercising its soft power [[99], p. 539].

In brief, the multi-level structure contentions and the direct presence of the US in the Persian Gulf region obscure the capabilities of the great regional powers.

4.5. Persian Gulf region: Environmental stewardship

The energy actors in this region, specifically Iran and Qatar, are the greatest CO_2 emitters through flaring at the global scale, Table 7, [101]. The rate of CO_2 emission in Iran was 203% in 2019, while the same was 21% in the EU [102]. Somehow the issue of CO_2 emission is not concentrated on policy documents of Iran, while the issue is in the 5th Five-Year Socio-Economic Development Program [103].

The comparison of CO_2 emissions in the Levant and Persian Gulf regions is expressed in Table 8.

Gas flaring is one of the primary reasons for CO_2 emission (see Table 9). Iran is not equipped with the required technologies applied to reducing gas flaring and is not a member of the global gas flaring reduction association [104].

Iran seeks to adopt a more active role in reducing CO_2 emissions. Iran's participation in the Conference of Parties 21 (COP21) and its support of the new climate change agreements are evidence of its intentions. The mission of COP21 is to encourage its members to develop and complete their respective objectives like the Intended Nationally Determined Contributions (INDC), a measure that Iran has endorsed [105]. Iran has not directly adopted the EU's strategies of 2020 and 2030 on CO_2 emission reduction [106]. Iran has made attempts to develop renewable energies, though many problems with international finance and investment, and lack of technology transfer, carbon credit exchange, and transition to clean technology applications hamper this possible endeavor [107].

Qatar, the next great CO_2 emitter at the global scale, had 35.6 tonnes of CO_2 per capita emission in 1990 and 38.8 in 2019 [[101], p. 181], and experienced approximately 40% reduction in the emission rate between 1990 and 2019 [108]. The Qatar Gas Fact Sheet recorded that Qatar Gas II's flaring was 4.9% in 2009, which was reduced to 0.49% in 2012 [109]. This reduction in gas flaring was the objective of Qatari corporations and materialized properly. Qatar has recorded a 67% reduction in total gas flaring between 2009 and 2014, where a 67% reduction in LNG train flaring shutdown since 2012, and a 45% reduction in LNG mega-train purge gas flaring between 2013 and 2014 is evident [110]. Qatar has not endorsed the World Bank's Global Gas Flaring Reduction Partnership (GGFRP) but is the first GCC state who observe global efforts in reducing gas flaring in 2009 [111].

Qatar's additional commitment to reducing CO_2 emissions is the ratification of the UN Framework Convention on Climate Change (UNCCC) on 18 April 1996 and the Kyoto Protocol on January 2005. Qatar hosted the 2012 UN Climate Change Conference (COP18) and the Kyoto Protocol's 8th Conference of Parties served as the meeting of the parties (CMP8), [112,113]. As to renewable energy types, Qatar plans to generate 20% of its total energy from renewable energies by 2030. Qatar's solar energy development was initiated by Qatar Solar Technologies, a trilateral venture between the Qatar Foundation, Qatar Development Bank, and Germany's Solar World AG to produce polysilicon, manufacture photovoltaic panels, and installation [114].

Despite Qatar and Iran's attempts to reduce CO_2 emissions at the state level, the environmental awareness of the public in the Persian Gulf region is low and climate issues are not seriously considered in the state agenda. The economy of these countries is highly oil and gas revenue dependent. Imposing carbon taxes on energy industries would make them vulnerable to prioritizing and implementing environmental policies [115,116]. The Persian Gulf states contribute to climate protection measures and targeted policies. To overcome the climatic drawbacks, more institutions must be established regarding renewable energy types if a green region is sought.

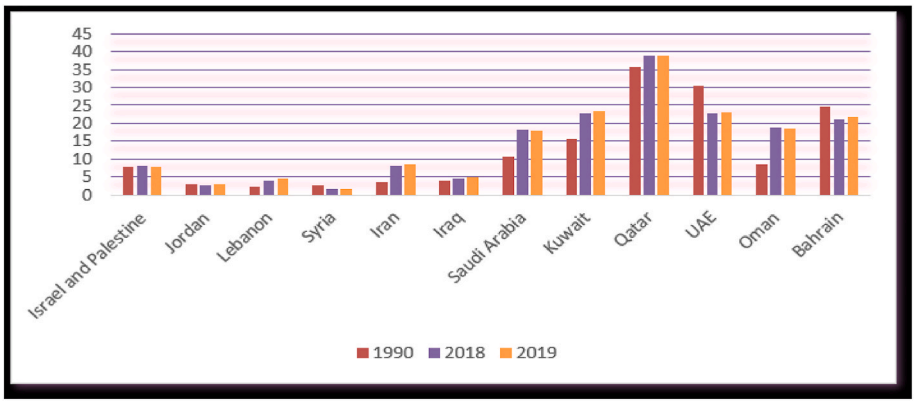
Most of the electricity in the ME is generated by steam-based power plants operating on natural gas or oil. The cumulative consumption of renewable energy types in the ME is low but due to environmental concerns and economic advantages, some countries are assessing the alternatives to decrease dependability on fossil fuel consumption for

Table 7
Total CO_2 Emission in the Countries of the Persian Gulf Region: tonnes of CO_2 per capita.

	Iran	Iraq	Saudi Arabia	Kuwait	Qatar	UAE	Oman	Bahrain
1990	3.64	3.96	10.59	15.53	35.69	30.60	8.59	24.17
2018	8.28	4.72	18.04	22.60	38.79	22.62	18.80	21.00
2019	8.47	4.89	18.00	23.28	38.82	22.99	18.54	21.63

Source: [[101], pp. 110–180].

Table 8
Comparison of Total CO_2 Emission in the Levant and Persian Gulf Region: tonnes of CO_2 per capita.



Source: Based on data in Table 3.5.1 and 8

Table 9
Rating of energy market integration of the levant and Persian gulf.

	Difference Similarity							
	High	Moderate	Slight	High	Moderate	Slight		
Trade	* - Most Persian Gulf countries like Qatar, Kuwait, and Saudi Arabia export energy to other regions.		–		–	–	–	–
Energy Diplomacy	–		–		–	* - Both sub-regions try to enter bi- and multi-lateral negotiations through energy institutions	–	–
Sovereignty	–		–		–	* - Strong role of territorial integrity and political self-determination in the sub-regions, which trying to reduce transaction costs and increase energy regulations	–	–
Great power Management	* - *Levant*: low energy power management because of inter-regional conflicts between Israel and Palestine *Persian Gulf: a variety of energy powers with variations in leadership*		–		–	-	–	–
Environmental Stewardship	–		* - Based on Table 8 content, the CO_2 emissions rate in the Persian Gulf is high, while the member states seek to reduce it.		–	–	–	–

Table designed by the authors.

power generation. In this context, the projected potential for photovoltaic and concentrated solar power in Saudi Arabia during the next two decades will be approximately 28 GW. The forecasted power generated from the wind, photovoltaics, and concentrated solar power, in ME, would be 15–25 GW by 2035. As to the non-observance of Copenhagen commitments, no climate policy managerial measures will be adopted in ME countries until 2025, but the announced targets by Saudi Arabia, Iraq, and the UAE for the consumption of renewable energy types [117].

According to the findings by the International Renewable Energy Agency (IRENA), and the World Energy Transitions Outlook (WETO) is that ME could obtain almost 26% of its total primary energy supply from renewable energy types by 2050, 53% of which will be consumed in electricity generation, thus, a reduction in CO2 emissions per annum. It is predicted that due to the Transforming Energy Scenario, the renewable energy market will raise employment by 2 million in the ME in 2030 from 542,000 in 2017. Concerning the climate emergency and the promise of all CO_2-emitting countries to meet their commitments to net zero, IRENA estimates that green hydrogen could meet up to 12% of global energy demand by 2050. Accordingly, the market for green hydrogen in the ME is moving from what seemed like a future hypothetical issue to a promising reality, subject to plans at the domestic level to meet demand from export markets [118].

In this endeavor, ME institutions like IRENA experience an almost breakthrough in resorting to renewable energy types. They can build on the synergy by more basic renewable energy industry capacities of the PG and the Levant regions as a part of existing information compilation and capacity building in the energy market. By doing so, a regional green energy cluster can evolve; though, to date, the institutions with ecological functions have not brought the ME green energy market actors together.

The energy market integration ratings of these two sub-regions are tabulated in Table 9.

The institutions in the Persian Gulf energy market are expressed in Table 10.

Table 10
The list of the institutions in the Persian Gulf Energy Market.

Trade	Diplomacy	Sovereignty	Greatpower Management	Environmental Stewardship
- **More formalized trade integration** - **GCC collective trade negotiations** - **But unilateral external energy trade through FTA** - **GCC-China consultation mechanism** - **GCC's Custom Union for reducing tariffs**	- The role of OPEC in energy diplomacy - OPEC's inter-state regulations - OPEC's efforts for stable energy markets - OPEC's weak internal relationships in 2003 because of the Iraq War - GECF's greatest natural gas producers in the Persian Gulf	- Importance of territorial integrity and political self-determination - OIC institution and supporting member states' sovereignty - Territorial disputes among the member states - Sovereignty hampers regional order - Inter-regional energy companies' cooperation	- Different levels of great power management - Iran's vast amount of oil and gas resources - Qatar is the greatest producer and exporter of LNG - Saudi Arabia is the greatest oil producer and exporter - Rivalries among the member states - Variations in their power	- Iran and Qatar as the greatest CO_2 emitters in the region - The important role of COP21 in climate change agreements - Iran's INDCs in developing renewable energies - Qatar's efforts to reduce gas flaring - UNCCC efforts to reduce climate change effects

Table designed by the authors.

5. Conclusion

The similarities and differences in the energy market integration between the Levant and the Persian Gulf sub-regions are assessed and compared by applying their functions, and the operational structure of the available institutions in the global energy policy context. The formal energy corporations, the Energy Charter, and energy contracts seek to develop energy market integration through their subject infrastructure projects, while, the informal sector like trade, energy diplomacy, sovereignty, and great power management makes both constraints and opportunities for energy market integration. As to the constraints, the ME member states have delegated limited functions to many energy organizations. The bi-lateral nature of many ME energy diplomacy institutions is a constraint for multi-lateral energy diplomacy institutions. Sensitivities on sovereignty make regulatory harmonization complex. As to the opportunities of institutions regarding energy market integration, the institutional structures encourage the two sub-regions for energy market integration through promoting infrastructure, harmonizing regulations, and bi-lateral and multi-lateral diplomacy, although the sovereignty and the great power management practices are at par.

In the Levant region, the states' delegations are more or less limited in the Arab League sub-organizations. The energy trade is not fully liberalized and the absence of an efficient market mechanism and a proper pricing mechanism is evident. Although the member states have limited inter-state trade investments, they have developed energy trade with the EU which reduced tariffs. Energy subsidies are gradually being eliminated in member countries and their interconnecting infrastructures are being developed like the EMIGI and Transnational Pipeline.

The assessments in the Levant region reveal that the economic and political disagreements among the member states pose obstacles to multi-lateral diplomacy. GAFTA and ESC have coordinated energy diplomacy. The Levant region states have increased their bi-lateral diplomacy with external organizations. Sovereignty complicates regulatory harmonization and its enforcement next to avoiding order-creating institutions. The great power management institutions are controversial regarding the tensions between Israel and Arab states.

In the Persian Gulf region, the assessments reveal that energy market integration is being formalized. The GCC states have been more successful than Iran in liberalization because Iran is subject to sanctions by the US and EU. Most of the GCC states have been and are engaged in unilateral energy trade negotiations through FTA. The Custom Union somehow reduced restrictions on the internal regional trade and common external tariffs, while, the absence of an agreed-upon mechanism to distribute tariff revenues undermined its implications. It is revealed that these states' energy export, upon which they heavily depend, is subject to the global energy market. External bi-lateral and multi-lateral energy diplomacy was founded by the establishment of OPEC, while, internal diplomacy was weak among the member states because of their political disputes. Unlike OPEC, the GECF's price mechanism and gas market have emerged and developed resorting to bi-lateral and multi-lateral diplomacy with other institutions. In these diplomacies, external diplomacy advanced more than internal. Sovereignty has hampered territorial integrity and political self-determination among these states, and due to the differences between the Persian Gulf states and foreign investors, regulations have become problematic. The multi-lateral negotiations have limited the capacity of the great power management in the region, thus, a supportive measure in energy market integration.

The institutional structure in both regions allows some sectorial energy market integration, essential with slow progress on the technical level. Overcoming the issues of trade institutions, the unresolved status of sovereignty in the Levant, the Persian Gulf region, and the multi-level great power management in ME require more time.

Based on the assessments made, the institutions as mere agents cannot accomplish energy market integration tasks in the absence of more legalized formal regulations and delegations of authority from the principle formal organizations which are in charge of the primary function of order creation. In ME lack of this function is among the many governmental drawbacks.

Recommendations: 1) mere functionality of institutions cannot accomplish the market integration, 2) the presence of more enforcing authority is essential, 3) transaction cost reduction must be of high concern and 4) involved institutions at the regional level should seek to overcome obstacles in this regard and do their best on the ecological function.

Future research is required to assess and analyse the inter-regional infrastructure projects and how the facilities and equipment are distributed there.

The similarities and dissimilarities of the regional institutions in energy market integration in these sub-regions are expressed in Table 11.

6. Policy implications

To develop ecological institutions the political tensions among the member states must be lowered to allow the adoption of proper measures. Their adoption of renewable energy would gain momentum if the member states followed the EU experience. Similar to the 2020 and 2030 EU climate and energy packages, the renewable energy directive is a legal framework that embodies all energy sectors in the EU in developing and supporting cooperation. Consumption of renewable energy types after the introduction of the Renewable Energy Directive (2009/28/EC), has evolved by reaching an annual growth, reaching more than 22% in 2020 in the EU. The scientific findings in 2022 confirm the EU's global leadership in renewable energy types [[119], p. 2].

To accelerate renewable energy types consumption, the EU has adopted the appropriate policy mixes regarding command-and-control, education and information instruments, economic, management, and planning instruments, Table 12.

The command-and-control instruments, allow actors to realize the

Table 11
Differences and similarities of the regional institutions in energy market integration in the two sub-regions.

	Similarities	Differences
Trade	Lack of full liberalization, efficiency in the market mechanism, full pricing mechanism, agreed mechanism to distribute tariff revenues, and limited intra-state trade investments, trying to reduce Energy subsidies, developing energy trade with other regions	With more energy liberalization in the GCC states, GCC's energy export at the global scale is subject to the global energy market
Energy Diplomacy	Economic and political disagreements among the member states but developing bi- and multi-lateral negotiations within energy institutions like GAFTA, ESC, OPEC, GEFC,	Variations in the level of energy diplomacy: to some extent strong intra-regional energy diplomacy (e.g., individual GCC states with EU and Asian countries), but weak inter-state energy diplomacy among the member states like the Levant countries
Sovereignty	Territorial integrity and the strong influence of political self-determination among the states	Variation in regulatory harmonization and order-creating institutions
Great Power Management	Great power management institutions are controversial regarding the political tensions among the states	Variations in energy leadership
Environmental Stewardship	Mitigation of the side effects of energy policies; developing renewable energy planning	Variations in reducing CO_2 emissions, more CO_2 is emitted in the Persian Gulf than in the Levant

Table designed by the authors.

Dos or Don'ts. If fossil fuel consumption is banned renewable energy consumption will increase indirectly. For example, Norway, an oil producer, prohibited the consumption of heating as part of an electrification strategy in 2020. Among the command-and-control instruments the forced phase-outs of fossil fuel power plants and the same for nuclear power plants are evident. The performance standard-type instruments embody quotas and obligations. The renewable energy certificates issued in Norway and Sweden make energy suppliers obtain certificates that fit their quota obligations. Obtaining a share of power from renewables is subject to its being legally binding or political. In the grid phase of the system, dispatch policies can prioritize, prefer, or require unhindered grid access for renewably produced electricity.

The economic instruments consist of penalties for consuming fossil fuels, on one hand, and on the other providing subsidies for renewable generation consumption promotion, investment in infrastructure, and adverse technologies therein. In this context, in the USA tax incentives for investing in renewable energy is evident. It is possible to reduce Value-added tax (VAT) for small-scale producers next to the fees applied for grid connection. To stimulate renewable energy deployment loans and grants could be contributive.

Table 12
EU policy instruments for accelerating renewable energies deployment.

Command and Control Instrument	Economic Instrument	Management and Planning Instrument	Education and Information Instrument
Bans on fossil fuel **Forced retirements** **Performance standard** **Targets**	Penalties (taxes, emission trading schemes) Subsidies Tax incentives Reduced fees (e.g., grid connection) Loans and grants Net metering	Land-use and spatial planning policies Studies on environmental and further impacts Benefit sharing schemes	RDI activities (incl. pilot projects and demonstrations) Educational material (incl. information dissemination) Cocreation

Source: [[6], P. 86].

Land-use and spatial planning policies drawn on allowing regulated proper sites for wind power plants constitute the management and planning instruments. Publicized forecasts on potential wind and solar power would support long-term planning and day-to-day management. The formal permit issued by relevant authorities in facilitating grid connection is embodied in this category. The concept of benefit sharing can promote the acceptance of the immediate populations in the project surroundings.

Cooperation of industry and public sector actors where citizen groups are involved is relatively low concerning renewable energy projects. The EU-level command-and-control instruments practices exceed the inbuilt mechanisms in the 2015 Paris Agreement regarding their degree of obligation, prescriptiveness, precision, and the means of controlling accountability and policy implementation.

All these have assisted the renewable energy interest groups to form in several member states, reinforcing the EU's path dependence in support of transition. Economic instruments are within the remit of national policy even though the European Commission monitors government interventions in energy markets. The national-and municipal-level spatial planning next to land-use policies for big-scale wind and solar projects constitute the management and planning instruments that support renewable energy. Beginning in the mid-2000s, and ending in the mid-2010s, the size of the European Commission became four-fold which made the cost of its pilot and demonstration projects regarding renewable energy exceed €150 million annually, which made the EU redefine its formulation structure in this context. The energy sectors cooperate with the climate, transport, building, industrial, and technology policy sectors [[6], pp. 86–88].

The EU's, Germany in specific, policies on renewable energy types, can be adopted gradually in the subject sub-regions if sustainable transition is sought. Renewable energy cooperation between EU member states and the Persian Gulf states since February 2022 is gaining momentum. For example, the Energy Deal Tracker consisting of Austria, France, Germany, Greece, Hungary, Italy, the Netherlands, and Poland has signed long-term deals with Bahrain, Oman, Qatar, Saudi Arabia, and the UAE. Most of these contracts are concerned with green transition and decarbonization. In September 2022, the German chancellor, Olaf Scholz, visited Qatar, the UAE, and Saudi Arabia. Qatar signed an energy partnership with Germany regarding renewable energy efficiency. They signed the Energy Security and Industry Accelerator Agreement to implement small-scale but big-picture initiatives while giving priority to environmental concerns. Germany's largest power company RWE signed an agreement with Abu Dhabi on blue hydrogen to store carbon emissions [[120], pp. 2–3].

Germany's foreign office has opened a green and renewable energy diplomacy office in Riyadh, Saudi Arabia. During the first visit of Sultan Haitham bin Tariq of Oman to Berlin in the summer of 2022, a declaration of intent was signed for closer cooperation in green and renewable energy types [[120], pp. 4–5].

The EU elaborated on a roadmap for its energy relations worldwide to facilitate a smooth transition from fossil fuel types to green and renewable energy types. The 2022 REPowerEU decarbonization strategy indicates the scale of the opportunity for exporters such as Persian Gulf states. The EU's External Action Service included energy as a domain of its proposal in May 2022 for "A strategic partnership with the Persian Gulf', endorsed by the Council of the EU in June. In the framework of COP28, some EU-UAE engagement has taken place at the level of meeting between senior officials. The European Commission vice-president Frans Timmermans, who leads the European Green Deal, and Kadri Simson, the energy commissioner, visited the UAE in January

2023 and Saudi Arabia in March 2023 [[121], pp. 1–2].

As the region gets ready to host COP28 in the UAE to unite the world towards formulating sustainable and practical solutions to the climate crisis, businesses in the region expect that governments step up and develop policy frameworks, similar to the Green Deal of Europe, consisting of a set of policy initiatives by the EU Commission to transition the EU towards a climate neutrality in 2050. The Persian Gulf states have the desire to see a new green deal fit for the ME, containing some form of climate legislation with incentive packages to boost green growth in the region [[122], pp. 1–2].

The EU policies, deals, and agreements can be implemented in the ME, and have substantial potential to advance the renewable energy and transition in the ME. It contributes to greater ME energy integration.

Credit author statement

1. Assistant Professor Fatemeh Shayan, corresponding author and first author: writing the whole article, collecting material, making the article structure, reviewing, revising based on the reviewer's comments and editing, conceptualization and methodology.
2. Professor Hossein Harsij: writing—reviewing and editing, validation and consideration.
3. Professor Daniel Badulescu: review and editing.

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Author contributions

Conceptualization, F·S.; methodology, F·S.; investigation, data curation, resources, correspondence, F·S.; visualization, formal analysis, writing—original and final drafts preparation, reviewing and revising, editing and validating, F·S.; writing—reviewing and editing H·H.; writing—reviewing and editing; funding acquisition, D.B. All authors have read and agreed to the published version of the manuscript.

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The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.There is not.

Data availability

Data will be made available on request.

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