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Jeddah Islamic Port: Strategies for Responding to the Probable Economic Shocks of 2020-2030

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Abstract. Jeddah is the sea gateway to the commercial heart of Saudi Arabia, and there are high expectations from the port to significantly increase its contribution to non-oil gross domestic product. However, the geopolitical issues between the United States of America and China intruded, then the COVID-19 pandemic which will significantly impact global trade. This study investigates the effects of these conditions and rising port competition on government policy (Vision 2030) for Jeddah Islamic Port. Interviewing key respondents in the public and private domains, this research fleshes out statistical measures, and critically reviews information from many sources to establish the ongoing status of Jeddah Islamic Port. Significant bottlenecks in landside logistics, such as road and storage facilities are currently being addressed. Current digitisation advances have been adopted in a supply chain logistics platform focussed on the port, and with plans for container loading-unloading and on-site storage automation. Sustainability is viewed by Mawani (*i.e*., port authority) as meeting international protocols on emissions and waste. However, the rise of mega-container ships, the enhanced Suez Canal traffic, and the dominance of Chinese shipping put pressure on the port administrators to engage with their port tenants and with foreign ports to ensure that Jeddah Islamic Port remains a key player in global trade. Inter-port communications are found to be a critical trade practice in the face of emerging competitions in the region.

Keywords: Vision 2030, Port Authority, Jeddah, Gateway, Middle East.

1. Introduction

Even before the global economic shock brought by COVID-19, seaports were responding to systemic change. Shipping accounts for some 90 per cent of world trade, and Haralambides, 2019 [1] explained that its evolution in scale and technology within the global supply (value) chains evolved past a measure of geographical distance to a position where ocean freight rates and port costs are now a proxy for a new measure of economic distance.

Shipping comprises bulk and container ships and their hybrids, and their sizes, for Jeddah Port purposes, are categorised at and below100,000 dead weight tons (USA) [2]. Container ships are measured in twenty-foot equivalent units (TEUs) and recent introductions range between 20,000 to nearly 24,000 TEUs, up to 4000 metres long. The largest ships are constrained to hub ports in India, Singapore, China, South Korea and Japan in Asia, and Hamburg and Rotterdam in Europe, where their cargoes are broken down and distributed through the supply chains [3]. Figure 1 illustrates (A) the change in freight categories and tonnage over some six decades, and (B) the dominance of Asian ports for receivables and distribution in 2018 (11 billion USA tons) [2].

Liner shipping refers to high-capacity, ocean-going ships that use set routes on set schedules [4]. Pre-2020, there were some 400 of these firms, maintaining weekly departures from their home ports. Liner ships comprise container and roll on roll off vessels, carrying about 60 per cent of freight by value globally each year. The hub ports serviced by these craft are shown at Table 1 [4].

As shown in the Table 1, there has been little freight growth over last five years, that occurred predominantly in China, South Korea, Europe, and the U.S.A. The top container port in the Arab region is the Port of Jebel Ali, Dubai, at 14.95m TEUs per annum at February 2020 before the COVID-19 pandemic, with a future capacity of 22m TEUs when a fourth container terminal is completed [5]. Jeddah Islamic Port is rated 36th in the world's top 50 ports but growth is minimal, as explained below.

1.1 Demand and Competition

Geopolitical tensions between the USA and China impacted trade about 2015, initially over disputed territory in the South China Sea, perceived world trade advantages unilaterally claimed by China, and then by oil price tensions 2018-2020 [6] (Fig. 2).

The complex and integrated global value-added system of lean just-in-time production (goods on demand) was reliant on efficient shipping and seaport/airport logistics services [7]. With the pandemic, structural damage to value-added chains occurred with unprecedented speed. Seaport and airport employees were sent home to isolate and shipping and logistics services fragmented, together with air-freight capacity. The effects of trade disruption stranded refrigerated and dry containers at import seaports and there were therefore insufficient containers at export seaports. Spoilt contents were not insurable under pandemic conditions, exacerbating disruption when small logistics firms became insolvent and disappeared. On the other hand, consumer panic buying of food staples and essential household goods caused unprecedented stresses on the same supply chains which were unable to respond to spiking demand. Although these phenomena subsided after some weeks, Hunt predicted that such behaviour would persist for perceived or real future crises. Thus the land-side value adding chain would have to adapt from just-in-time to just-in-case, with essential dry products stored either complete or as their constituent parts for fast assembly [6,7].

Competition was building amongst ports and shipping using the Red Sea route as well. The Suez Canal was widened and deepened and in June 2020 was transited by the world's largest 24,000 TEU container vessel, the HMM Algeciras, which is deployed on the Far East Loop 4 route [9]. In 2019, about 19,000 ships used the canal, carrying 1.1 billion tonnes. Paradoxically, the fall in fuel prices saw traffic avoiding the high Suez transit fees in favour of a Cape transit, although the Maritime Executive (2020) [9–11] reported massive discounts by the Suez Canal Authority to dissuade firms from the longer route.

Jeddah is a hub port for many other scheduled routes: Far East Loops 1 and 5 routes, Mediterranean Service 2 and 3 routes, the Gulf/Eastern Mediterranean Service, Indian Subcontinent Service 1 (with King Abdullah Port), Indian Subcontinent Service 2, Indian Subcontinent/Mediterranean Express Service, and the Indian Subcontinent/United States East Coast Service. Jebel Ali Port in Dubai is also a hub port on nine similar route configurations (SMA Logistics).

The United States east coast service route was a response to changing trade patterns with east Asia to avoid the 'land bridge' from the east coast to the west coast seaports when the Suez

Canal could take more shipping [12]. Saudi Arabia has long contemplated its own land bridge, an extensive freight railroad of nearly 1000km connecting Riyadh and Jeddah, taking in Jeddah Port. It was first proposed in 2005 as part of a railway master plan, renewed in 2011 as an unsuccessful public-private partnership, then raised in 2019 with the Chinese to connect the Red Sea with the Arabian Gulf at Dammam [13]. However, a report from Dubai Ports (DP World) (sometimes Dubai Trade World) regarding Jeddah's Southern Terminal concession also recorded an interesting comment from DP World's Chair:

> Beyond the terminal, our ambition is to develop inland connectivity across the Arabian Peninsula between Jeddah and Jebel Ali Port in Dubai, as well as to Saudi Arabia's cities through smart technology-led logistics, which should support further growth in this strategic hub that connects East-to-West [14].

Arguably, connecting the two ports and their shipping liner routes would improve the competitive position of both ports and thereby both Saudi Arabia and the United Arab Emirates.

As the COVID-19 pandemic disrupted global populations and economies, the World Bank [15] estimated in June that the global economy would contract by 5.2 per cent in 2020, the steepest decline in decades, and disrupt global trade and supply linkages. Due to weak oil prices and investment uncertainty, Saudi Arabia's gross domestic product was expected to contract by 3.8 per cent in 2020, and without further major disruption to recover in 2021 by 2.5 per cent [16]. Figure 3 shows the preliminary effects, with first quarter 2020 Saudi exports down by 3.3 per cent from first quarter 2019. Similarly, imports fell by 7 per cent on the year 2020[17].

Disruptive risk to seaports has been foreshadowed by past researchers, if not at the universal nature of the COVID-19 pandemic. In a literature review, Loh, Thai, Wong, Yuen, and Zhou studied 19 crises relevant to seaport infrastructure and resources, finding port management largely unprepared for such crises [18]. Underlying global tensions, Almutairi et al. [19] noted that local intermodal systems centred on ports were characterised by complex and uncertain access and egress for multiple groups of stakeholders. These included conflicting interests of port users, local residents and businesses adjacent to ports. Loh *et al.* [18] devised a risk assessment model to plan for port disruption, and Almutairi *et al.* [19] produced a model to strengthen the resilience of port stakeholders and their neighbours in such situations. Whilst these strategies could not respond to the scale of the pandemic, they could be useful in reducing recovery time for a seaport's operations when the economies reopen fully.

1.2 Characteristics of Saudi Ports

The Arabian Peninsula was a traditional trading route, benefitting from the fabled Silk Roads established in 119BCE by the Han emperor Wudi. By the 10th century CE, the Silk Roads web had developed as land (caravans) and sea trade routes between Asia and Europe, including the Arabian Peninsula [20]. In 1938, after the country's foundation, oil was first found in Saudi Arabia at Dammam No. 7, the Prosperity Well, which eventually produced 32m barrels of oil. The Arab and American Oil Company (Aramco) assisted the new kingdom with initial infrastructure construction that commenced the Kingdom's eight-decade socioeconomic development [21]. Aramco's Ras Tanura port was established as part of this development, along with the first vocational school to skill up Saudis for developing the oilfields, and a hospital (Tesch, n.d.). Initial distribution networks included the 1212

kilometre Trans-Arabian Pipeline that connected the oilfields to Mediterranean ports [22]. Once the oil delivery system was in place, seaports continued to be developed under the Ministry of Transportation (later Transport). Seaports were delegated to a separate authority (General Organisation of Ports) in 1975, then corporatized in 2018 as the Saudi Ports Authority [23]. As part of its economic planning at the turn of the century, the government privatised operations at all its ports [24,25].

Saudi Arabia has the largest port network in its geopolitical region, with nine seaports, which Mawani administers, plus Aramco's Ras Tanura port. Jeddah Islamic Port is the largest of these, handling some 65 per cent of the Kingdom's freight capacity [23]. These ports are under long term contracts to the private sector, and as part of Vision 2030 initiatives to promote trade, exports have limited free storage and discounted fees [23] (Fig. 4).

Proclaimed in 2016, Vision 2030 included the national industrial development and logistics program which comprised four sectors: industry, logistics, mining, and energy [27]. In the logistics sector, the national plan calls for technology-enabled (smart) containers, smart transit flow management in and out of the ports to reduce ships' time at the port, and significantly enhanced digitalisation of freight and customs processes [27].

1.3 Jeddah Islamic Port

Jeddah Islamic Port has an area of 12.5 square kilometres with facilities for passengers, containers, and bulk freight. Its maritime services include two navigational channels and four basins, cargo handling equipment, marine services, advanced shipping services, warehouse yards with grain silos and edible oil tanks, a retention and re-export zone, and a passenger terminal for Hajji pilgrims enroute to Makkah and Al Madinah. The port management includes seaside and dockside infrastructure and services such as ship monitoring and controls, and throughput trade data for supply chains. Part of these services include extensive warehousing and equipment suppliers, a retention and re-export (free zone) section, shipbuilding and repair facilities, and a passenger terminal predominantly for pilgrims to the Two Holy Mosques, all privately operated. Freight terminal operators include Al Esnad north and south terminals (Mansour Al-Masaid Co., International Technical Co.), Northern Containers (Gulf Stevedoring and Contracting Co.), Southern Containers (DP World), and the Red Sea Gateway Terminal [28,29]. However, only DP World (south) and Red Sea Gateway (north) confirmed this information. This was supported by AlSharq Al-Awsat (2019) [30] in reporting 30 year concessions with DP World and Red Sea Gateway Terminal (RSGT) to use Jeddah Islamic Port as a regional hub, including a free zone for freight redistribution in the region. Port logistics were enhanced by the establishment of the Al-Khomra Logistics Zone to the south of the port in 2019, and LogiPoint's bonded trade corridor linking King Abdulaziz International Airport in the northern suburbs to the port for multimodal cargo [14, 31, 32].

In digitalising Saudi seaports' supply chains, Dubai Trade (DT) supplied an integrated logistics platform which integrates shipping lines and port operators to schedule ships, berths, cargo details, and times for users to arrange cargo dispatching and pay port costs [23]. Table 2 shows throughput for the port for 2019 [23, 28].

1.4 Port Competition

Geopolitical tensions and the pandemic have cast doubt on future economic growth in the region. However, fundamentals remain, such as Jeddah Port's competition from the joint venture King Abdullah Port (Saudi BinLaden Group and Emaar) further up the Red

Sea coast [12]. King Abdullah Port (2020) was first operational in 2015. It reported a 3.3 times expansion for bulk and general cargo in 2019 from its 2018 throughput to 2.98 m t (tonnes), whilst container throughput increased 7.2 per cent (203,670 in 2019 from 190,005 in 2018) during a global decline of 12.2 per cent due to geopolitical tensions and ships offline to upgrade their emission standards [29].

United Nations Conference on Trade and Development's (2020) liner shipping connectivity index for ports ranked Jeddah at 50.2 in 2019 and King Abdullah Port at a new record of 46.15. DP [33,34]. World's Jebel Ali, on the other hand, is at 74.55 for 2019, down from 76.01 in 2018. For comparison and as an international hub, Singapore's index was 124.6 for 2019 [35].

As Ardemagni noted, these large capacity terminals and ports risked uneconomic development unless they cooperated or found separate cargo category niches [35]. At present, all these ports offered full services and would be expected to compete on freight rates. This appears to be in play, as Dubai Ports (DP) World announced that together with Mawani, it was launching a new shipping line between its ports of Dubai, Jeddah. and Sokhna Port in Egypt [36]. Further competition for regional trade for Jeddah will come from King Abdulaziz Port at Dammam in the Eastern Province, with Saudi Global Ports and Port of Singapore (PSA) International (2020) entering into the Kingdom’s largest 30-year concession to operate the port, which could be seen as competition with the United Arad Emirates ports [35].

1.5 Research Aim

This is a study of Jeddah as a prime example of seaport evolution. It became the sea route entry hosting Islamic pilgrims, then last century emerged as Saudi Arabia's commercial centre, part of the global supply chain of sea and land logistics. In considering the views of Jeddah Islamic Port's leadership and stakeholders, this research seeks to understand current operations at the port, the challenges from competitors, and the pathways mapped out under Vision 2030.

1.6 Literature Review

There is considerable literature on port performance. A review of research interest found division into performance measures, largely multivariate regression modelling; and characteristics of seaports such as infrastructure, sea and landside port logistics, systems digitisation, and sustainability. These factors form UNCTAD's scale items.

1.7 Comparative Seaport Measures

Data envelopment analysis is a measure that models relative efficiency on characteristics of inputs and outputs (decision-making units). Of interest to this paper, Chen and Lam modelled the relationship between a city and its port [37]. The input variables used for the port were infrastructure and facilities, and output was the annual freight throughput; for the city inputs were land area taken from the city, energy, and labour. Desirable outputs was gross domestic product, undesirable outputs were carbon emissions. To these could be added traffic congestion and loss of habitat along the foreshore. Chen and Lam used this modelling to identify best practices for any port, recommending Singapore, Hong Kong and Busan in South Korea.

Whilst using this technique to model revenue generation in ports, Zahran et al. noted its limitations and added qualitative 'post-DEA' data, such as size and type of seaport [38]. In a review of the literature, Ensslin, Dezem, Dutra, Ensslin, and Somensi pointed out that researchers' seaport performance methodologies were primarily data envelopment modelling based on generic operational data and avoiding contextual ambiguities [39]. Casagrande

concurred with this view, stating that location, and legal and jurisdictional status are important influences on port operations [39]. For the current study, these observations from Casagrande, Ensslin et al. (2018), and Zhran *et al*. (2017) indicated that factors such as type and age of port, ownership, and government policies also influence port operations [37,38].

1.8 Infrastructure Standards

There is an established relationship between the quality of a seaport's infrastructure and its logistic performance, and these significantly affect the country's economy [40]. Munim and Schramm discounted job creation at the seaport itself as a performance indicator, stating that employment was created landside (hinterland) through the supply chain, including logistics. They also reported a lack of correlation between seaborne trade and the national economy in the literature and their findings, attributing this to the increasingly services-based sectors in developed economies, and their largely one-way import trade. Thus the growth in gross domestic product per capita in developing economies has a greater relationship with seaborne trade through goods imports and exports than that of their more developed trading partners. Again, this is relevant to Saudi Arabia: if it is an emerging economy, then economic growth would be lower than the East Asian economies; or taken as a developing economy, its main export is bulk hydrocarbons more so than seaborne container traffic. As the country's business capital, Jeddah's port is the predominant seaborne entry into the country.

1.9 Logistics and Supply Chains

Logistics (transport and storage) influence efficiencies in the global trade supply chain (optimum delivery of goods to the customer). Notteboom and Neyens (2017) argued for the European concept of 'synchromodality' [41,42]; basically to take advantage of the high concentration of cargo at a seaport and the use of networked inland hubs to distribute containers by the most efficient (thus cost-effective) mode at the time, which may be road or rail. In Malaysia, Jeevan, Chen, and Cahoon (2019) also found that 'dry ports' (inland hubs) were influential in seaport performance through reducing container congestion at the port and maximising logistical efficiency [43].

Taken as linkages in a supply chain, seaport systems and infrastructure modifications are less readily adapted than transport options. The Stockholm Royal Seaport underwent a staged renewal project, delivering new infrastructure in each area over time. Karrbom Gustavsson, Hedborg Bengtsson, and Eriksson (2017) studied the impact on supply chain partnerships at the port, and how the chains adapted to the disruption [44]. They found that the supply chain was disrupted between the old and new stages of the port program, as well as within each project stage. Karrbom Gustavsson *et al*. found complexity from the staged program for the port's throughput (supply chains) due to the contractual objectives of the infrastructure projects conflicting with the port's operations, and the chains were also disrupted by the longer term staging, These findings were supported by Pavlov, Ivanov, Pavlov, and Slinko (2019) studying disruptions to seaports in California which impacted industries' production both at sea and on land, especially those closest to port operations [44]. Pavlov et al. advised that a robust supply chain design should be in place to account for crucial disruption, but without over allocating resources to contingency situations, such as selection of seaports. This is of interest in this research, as Jeddah Port's central Red Sea position was recognised as being an excellent port from Dubai through to Egypt.

1.10 Systems Digitisation

There is significant research on the evolution of supply chain communication systems leading to seamless member connections and thus to digitisation and automation, particularly at the crucial node of seaports. Coronado Mondragon, Coronado Mondragon, and Coronado (2017) studied these aspects in several multi-modal seaports' terminals [45]. They found that interoperability, that is, the proliferation of technologies and customer expectations for supply chain information transparency were impacted by government legislation (such as data security and privacy), and the technology choices of dominant terminal operators. The differences between global seaports' technological standards were established by Ferretti and Schiavone (2016) [46]. They found that in the Port of Hamburg, Germany's adoption of internet-connected services resulted in significant business process redesign for the multi-modal port. For example, as a long term trading partner with China, Hamburg liaison offices were established late last century in the Port of Shanghai (and the reverse occurred) to coordinate and facilitate cargoes. This underscores the issues for Jeddah in making technological connections with other seaports to facilitate maximum port usage.

1.11 Sustainability

Environmental sustainability is inherent in seaport operations in managing discharges and emissions, risk management, modifying power usage, and managing surrounding land and sea ecosystems [41, 42]. However, Lozano, Fobbe, Carpenter, and Sammalisto (2019) broaden this identification of sustainability to include economic (profitability), the internal and external social environments, and time as well as the natural environment [47]. Further, they argue for a holistic approach, taking in legislative, technology, capital structures (but not organisations at the port) and even organisational change. Many other writers investigated local environmental sustainability at their seaports, including Lu, Shang and Lin (2016) in Taiwan and Hong Kong [48]; Notteboom and Lam (2018) in Belgium [41], Germany and the Netherlands; and Ashrafi, Acciaro, Walker, Magnan, and Adams (2019) studying corporate sustainability in North American seaports (maritime ports) [10]. Thus sustainability may have different interpretations in different jurisdictions, and indeed, among authors. Issues in maintaining sustainability included cost, skills, and knowledge and therefore implementation of practices, and customer disinterest.

Interestingly, Min, Ahn, Lee, & Park (2017) proposed that terminal operators at a Korean seaport should act as an integrated terminal operating system as a sustainability measure, given reduced use of resources, efficiency, and cost reduction [11]. An over-arching organisation of competing terminal operators would save resources, better utilise the port's infrastructure and facilitate standardisation at the port, improving its competitiveness with other regional seaports. Williams (2019) entered the discussion on sustainability with a circular regeneration concept, otherwise used in city renewal [49]. In this version, the urban renewal process of loop, regenerate, and adapt was applied to the Royal Stockholm Seaport. Williams found that sustainable outcomes from the port's processes included sharing, optimising and substitution; however, there were insufficient indicators or measures available to track benefits from port renewal.

In Korea, Kang and Kin (2017) studied a range of factors influencing seaport sustainability, finding that decision-making items for ports governance and guidance could be themed as communication and cooperation, quality assurance, monitoring and upgrading,

process and quality improvement, environmental technologies, and active participation [10,19,50]. These themes underscore a problem for seaport management, that is, decision-making is made from a sustainability viewpoint rather than performance, competition, supply chain or customer perspective. Arguably, a sustainability perspective could be subsumed into leadership, or a number of other perspectives.

1.12 Saudi Literature

Recent literature on Saudi ports concerned staff skills and competencies on productivity [51]. Alghaffari, Nguyen, and Chen (2018) studied organisational effectiveness of Saudi seaports [52]. Contributing factors were, as expected, finance, strategy, operations, customer relations, human resources, and productivity research. Commenting on over-use of the road network environment for Jeddah's seaport, Aljohani and Thompson (2017) recommended that various transport and road authorities urgently address congestion, provide meaningful transport options other than bans, and consult with the freight industry and port authorities [25]. Other quantitative analyses included Alharbi, Khattab, Ali, Binnaser, and Aqeel's (2018) study of seafloor (littoral) contamination at Saudi seaports [53].

Of importance to this paper, Abbas and Abd El Halim (2015) pointed to the continual development of the Suez Canal and the Egyptian focus on attracting development, which they argued, is to the detriment of other countries bordering the Red Sea unless a supply chain perspective is adopted [2,54]. They caution that the region can benefit if national seaports on the Red Sea 'move toward integration and service complementarities and avoid competition and/or loss of opportunities' [54]. This was confirmed by the Suez Canal Authority stating that 18,880 vessels transited the canal in 2019, with revenues increasing 1.3 per cent for the Authority from 2018 [8,54].

2. Methodology

The aim of this study was to seek seaport leadership's perceptions of traditional measures for ongoing port activities in light of disruptions in other industries in the supply chain and the influences of private sector investment in terminal operators' businesses. The disruptions refer to the rise in foreign investments in the Kingdom by United Arab Emirates, Chinese, Indians, and Russians through Vision 2030. Evolution in other industries required port structural changes to accommodate the mega-containerships; and data-based changes to manage identity, source, and progress of itemised goods. Automated data collection was considered a facilitator for port administration as Jeddah Islamic Port fends off growing 'mega-port' competition.

An early methodology developed by Alexander, Comfort, Weiner, and Bogue (2001) considered how public administrations managed private sector entities reporting to meet the authorities' goals and guidelines, but within a profit setting [56,57]. Further, Alexander et al. stated that public and private partners led individuals in their organisations responsible for communications across different working environments, mindsets, and organisational agenda. Thus public-private partnerships are collaborations, rather than being subject to detailed and formal controls such as a bureaucracy. The themes identified by the researchers in public-private partnerships were a common goal (vision-based leadership), power-sharing, common systems (especially with ports in global supply chains), incremental leadership, and their concept of 'process-based leadership'. These issues are exacerbated in this study by adding competition and high performance targets.

Survey questions for the investigative research design include collaborative port performance, external and internal (terminal) competition including infrastructure, sustainability, digitisation, comparative seaport measures, and the influence of supply chain realities on the private partners and externalities in the supply chain, such as land transport (rail and road) (appendix). The leader sample comprised:

1. Representative of the Saudi Ports Authority's Board.
2. A private sector representative on the Board.
3. A representative from DP World Middle East (Southern Terminal).
4. A representative from Red Sea Gateway Terminals.
5. Representatives from the Port's executive.

3. Results

Interviews were held over September – November 2019. The first interviewee was a representative of the Saudi Ports Authority (Mawani) who was asked for comments on the progress of Jeddah Islamic Port towards any interim (2020) goals, and its overall strategy for Vision 2030. The interviewee noted that the port was on track to reach its 2020 objectives, having achieved 39th position in a global index. The World Shipping Council (2020) ranked container ports purely by 2019 throughput, with Shanghai first at 42 million TEU, Dubai (no. 10) at 14.95m TEUs, and Jeddah (no.36) at 4.12m TEUs. On this measure Jeddah Islamic Port had dropped 2.3 per cent from a high of 4.2m in 2014, well before Vision 2030 was proclaimed.

The Mawani representative was then asked about port logistics modernisation, such as road/rail planning, freight storage and documentation facilitation to improve Jeddah's liner shipping connectivity index. The answer was that Mawani managed the country's government-owned ports' administration, and Jeddah Port had standardised container and item tracking and efficient documentation processes in place. However, its latest published website statistics (pdf) at the time of writing were for 2017 [25, 45, 58].

A port constraint was, and remains, traffic flow. Trucks are prohibited from entering and leaving during morning and evening rush hour, disrupting delivery and shipping timetables and adding to costs. Despite freight rail's logistical importance, the Ministry of Transport apparently did not take this into account until recently and this may affect national and international trading with the east coast. The representative commented that lack of rail services to the Port was an issue for its productivity. Container handling and storage in the dockyards, however, were designed for adequate capacity for the terminals.

On the question of continuing privatisation, the representative stated that the government was committed to its current program to remove itself from service industries, including the ports, and assume a regulatory role as conditions permitted. However, the interviewee disagreed with the term 'privatisation', stating that the Saudi government used income sharing contracts for operation, management, and maintenance of the port berths.

Asked about technology transfer, the reply was that in 2017 all Saudi seaport organisations transferred their data administration to a single information platform, Port Community System and Electronic Data Interchange to facilitate cargo delivery and flow of information among seaport users. However, this is an ongoing program for updating all administrative and operational systems to align with international practice.

There is global activism on 'sustainability' which may have different interpretations in different countries, including maintaining or improving the natural environment, business practices such as power sources and port maintenance, and even social issues such as gender equality. Issues in maintaining sustainability included cost, skills and knowledge and therefore implementation of practices, and customer disinterest. The Mawani interviewee responded that, for the Ports Authority, the term sustainability was viewed through a productivity approach. As a national government agency, Mawani observed international conventions such as carbon emission ratios for which Jeddah Port had internal sources from its cranes and vehicles onsite, and introduced sources such as land and sea customers and supply chain members. To highlight its commitment, Mawani is party to the International Maritime Organisation's (2019a) Sulphur 2020 [59], which aims to cut ships' sulphur emissions from 3.50 per cent m/m (mass by mass) to 0.50 per cent m/m. Saudi Arabia is a signatory to the international convention for the prevention of pollution from ships. This entails providing adequate facilities to accept solid and liquid wastes and a zero tolerance of illegal dumping from ships at sea in Saudi waters [60]. However, Mawani was pursuing social goals such as gender balance somewhat differently due to the Saudi culture, although they were considering a greater role for women in some circumstances (ports administration).

Planning program for Vision 2030 [27] comprises:

- Continuing the participation of the private sector (not privatisation) in port development.
- Budgeting for continuing port upgrading, including automation.
- Improving operational systems for ship handling, inspection, transport and clearance operations.
- Attracting global shipping lines
- Revenue improvement for both private and public operators.
- Resolving issues of accessibility to the port.
- Absence of dry port (dedicated logistical centre, now planned) despite the proximity of the port to the four industrial cities in Jeddah.
- Lack of professional logistics transport companies.

The Mawani representative also commented on the opportunities derived from the upgrading of the Suez Canal and development of its Ports, especially Port Said. The interviewee was unperturbed of the threat of King Abdullah Port north of Jeddah, as the Jeddah Islamic Port would benefit from the rising trade and its nexus of future multimodal transport connections and logistic hubs, Jeddah's manufacturing and trading sectors, and China's view that Jeddah Islamic Port should be a major hub for the Silk Road (Belt and Road policy). Since these interviews, there may be some changes in the Saudi rail land bridge Chinese proposal, due to subsequent discussions with Dubai over linking Port of Jebel Ali and Jeddah Islamic Port [6, 12, 13, 30] Wescott, 2020).

From the interviewee's view, the logistics sector was a major drawback for Jeddah Port's progress. The Kingdom did not yet have professional logistics services as it lacks specialists in this field; regulations for a logistics framework, and available suitable land. This has since been partly addressed through LogiPoint’s bonded trade corridor linking King Abdulaziz International Airport to the Al-Khomra Logistics Zone at the seaport,

including free zone facilities for cargo transhipment [14, 32]. The interviewee stated that World Bank's 2018 Logistics Performance Index for Jeddah Port was low, with 3.01 rating from a 0-5 scale. The measure includes customs (data platform installed in 2017); infrastructure and transport (on site and external connections); shipping rates ($US1000 per ship); logistical competency; and scheduling.

According to its website, the World Bank (2019) rated Saudi Arabia at 3.01 in 2018, (latest available at the time of writing), 55th from 160 countries. United Arab Emirates was rated 11th (3.96) with the top 10 countries predominantly western Europe, Hong Kong was 12th [15, 61]. The index comprises customs, infrastructure, international shipments, logistics competence, tracking and tracing, and timeliness.

The question is why the UAE is distinguished from us in the logistics sector, why Jebel Ali port is the 10th in the world and the first Arab in handling containers and logistics services. The answer is simple (advanced logistics and customs services) (Interviewee 1).

The next interviewee was a private sector member of the Mawani Board. The interviewee was asked to comment on the port's progress in technology, especially automation. The representative said that whilst the port was administered through Mawani, its terminals were privatised, with firms such as Red Sea Gate and Dubai Port terminal leases renewed in 2019, with the addition of another berth. The privatisation (disputed by the first interviewee) plan would continue, as noted in this research by the logistics initiatives. This was relevant to the next question to the Board member regarding possible oversupply of capacity along the Red Sea. However, the interviewee disagreed, stating that the port continued to upgrade to meet the standards of current shipping and to be competitive in its industry. The expansion of the Suez Canal had increased the number of ships through the Red Sea to 18,000, and Jeddah was Saudi's main port for transit trade. Lloyd's List (2019) concurred with the World Shipping Council (2019) placing Jeddah Port's TEU throughput for 2018 at 4.12m TEU, down slightly from 4.15m [4, 62]. As a Suez Canal competitor, Port Said's TEU throughput for 2018 was 3.05m, up 2.8 per cent from 2017's 2.97m TEU [63]. As noted, the World Bank warned of disruption to global trade and supply linkages through contraction of world trade in 2020/2021 [16, 61]. For the last question on sustainability, the interviewee responded with Mawani's commitment to achieve the standards of the Maritime Convention to reduce carbon emissions. There was no comment on remediation of the seabed due to the port's activities.

The third interviewee was a port client, Dubai Ports. The representative was asked whether Jeddah's port administration (public/private partnership) was sufficiently flexible to respond to changes to maximise port users' profitability. The response was that Dubai Ports had a ten-year contract with Mawani, as the owner of Jeddah Islamic Port, and they had agreed to a series of productivity targets (now extended to 30 years and with significant upgrading). A question regarding issues for Dubai Ports regarding technological integration with its suppliers, customers, or regulatory authorities (system integration, user cultures, infrastructure issues) was similarly a non-committal answer as 'continuous modernisation plans'. The final question concerned DP World Middle East's logistics role in Saudi Arabia. The representative replied that the corporation does have a logistic business in Saudi Arabia, and that there were plans to extend this by investing in the port once current negotiations were finalised.

Again, the fourth interviewee was Red Sea Gateway Terminal, with similar generalised answers regarding agreed productivity targets and expanded infrastructure. However Red Sea Gateway were somewhat critical of the reliance on the overworked road transport system, advocating for multimodal transport options (construction of the Saudi Land bridge). The representative was asked to elaborate on their policy of corporate social responsibility. The interviewee replied that the policy comprised ethical behaviour, respect for stakeholders and law (employment practices) and for human rights. They considered honest, constructive collaboration with all stakeholders, including the business community. Their internal focus was health and safety, education, and people (staff), and the physical environment.

The fifth interviewee was from Port Administration. The Operations official was asked how the port was assisting its private sector concessions and terminals by improving its infrastructure and port systems. The reply was that terminal automation through the Port Community System and Electronic Data Interchange was well advanced, and that the next stage was for the automation of the dockyard (loading and unloading of cargoes) for both improved port performance and to improve safety. This follows other seaports that have either partly or wholly replaced manual labour with automated container and cargo handling. Mawani is staging port yard automation around the country, and the representative expected that as the country's main commercial seaport, Jeddah Port would receive early consideration. A final interview took place with an official from the port's External Relations Board, who was asked about relationships with the growing King Abdullah Port. The official commented that due to the public concession (Jeddah Islamic Port) and private consortium (King Abdullah Port) structures, there was both a complementary factor as both were striving to enhance the Saudi trading profile, and competitive when they were both attracting Red Sea traffic.

The interviews were completed by asking the official the Port's plans for the immediate (2020) and long range plans to achieve their objectives under Vision 2030. These were:

1. Enhancing the port's competitiveness and engaging port clients in planning its development towards 2030.

2. Improve the port's capacity and terminal operations using sustainability principles.

3. Aiming to attract foreign investment in the port by 70 per cent from 2016 levels by 2020.

4. Develop the landside infrastructure and throughput capacity of the port to facilitate Saudi manufacturers' export potential (Logistics Performance Index from 49 to 25 [51 in 2019]; non-oil exports from 16 to 25% of GDP).

5. Reduce the container shipping turnaround from the current 5 days to a week to three days.

6. Attain 12m containers (TEU) pa throughput by 2030 (currently 4.1m TEU).

4. Findings and Discussion

In commenting on the digitalising of port documentation, DP World made the point that the firm's evolving timeline, like the port's, was continuous and decades past Vision 2030, rather than 2030 being a goal in itself. This was supported by the confirmation of the 30-year extension to DP World’s terminal concession, whereby it will invest $US500m in a new terminal, plus supporting agreements such as the new shipping line to Egypt [32]. Another finding is that the international indices and statistics used to benchmark international ports

comprise a range of measures that may be internally consistent but are not helpful when at any time trading conditions, technology coherency, port capacity, and even the COVID-19 pandemic subsumed the indicators. One of these indicators is median time in port, where Jeddah rates consistently with other ports and world medians (Table 3).

However, this does not measure waiting times to enter port which can be a function of port activity or outside the port administration's control. Figure 5 shows Jeddah Islamic Port shipping locations at 6.37am 4 July 2020 [64].

There were few ships waiting to enter port at this time, so that there would appear to be no systemic issue with port access or throughput.

The port's logistics issues were being addressed before the COVID-19 pandemic by new concessions for terminals and logistics firms (transit and storage) (DP World, Red Sea Gateway, LogiPoint); nevertheless, there was little success in reaching Vision 2030's ambitious ranking of 25 for the Logistics Performance Index to date as it had slipped from 49th in 2016 to 51st in 2019 [65]. Improvement would have to await infrastructure and technology solutions put in place over the past several months (Fig. 6).

Similalry, the COVID-19 pandemic would impact the kingdom's oil/non-oil components of its gross domestic product (Table 4, KPMG 2019).

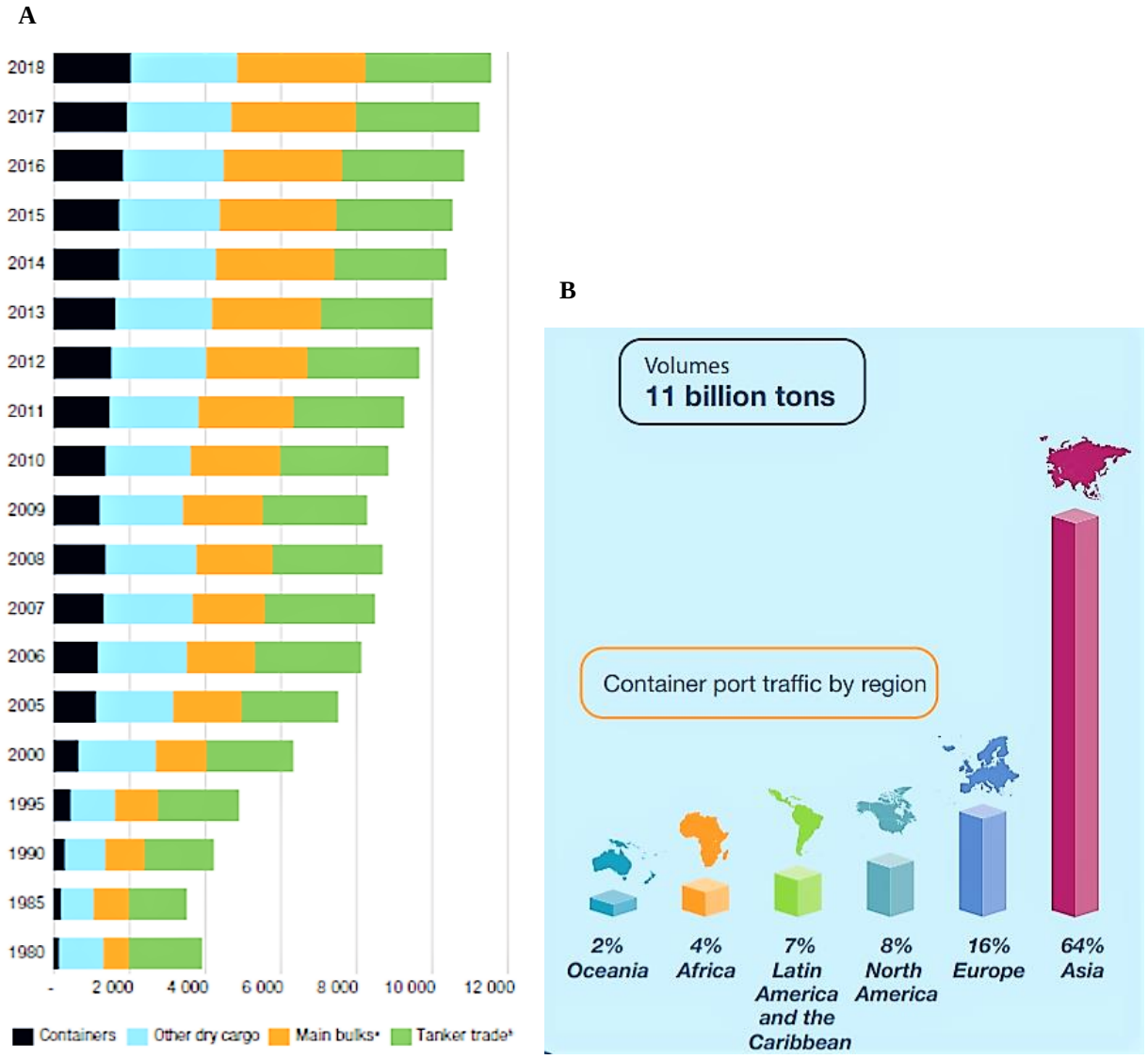
Land use was found inadequate for the notion of a dry port and a logistics hub and this was placed at Al-Khomra, 18 km south of Jeddah Islamic Port. However, the presence of the Naval Dockyards between the two logistic centres may complicate both road and (eventual) rail transport, as it is unlikely that further freeways can assist in reducing congestion at peak hours. Finance was also a problem, as the Mawani representative and Port representatives commented, although Railway Technology (2019) reported that a Saudi Landbridge agreement was signed between the Kingdom and Huawei as part of China's Belt and Road policy [13]. Interest in Chinese-Arab partnerships dates from a state visit by President Xi to the Kingdom in 2016 [67]. An excellent analysis of conditions and issues for Saudi road/rail freight from Jeddah, with framework/model, is available from Tayyeb [68].

Introduced in 2017, the port's logistics community system (data management platform) was well advanced at the time of interviews (October 2019). The port's administration was moving to dockyard and storage automation, although there was little published information on this. Vision 2030's targets included significantly raised exports (non-oil productivity), however, the Mawani representative from this research mentioned the lack of adequate import/export services. This is curious, as a Google search showed at least a dozen firms in Jeddah offering such integrated services, although some operate out of the major terminals. Further, the 'new' Al-Khomra dry port was already a significant import/export precinct.

Organisational and employee development are beyond the scope of this study, particularly as these are controlled by Mawani. Sustainability is also adopted by Mawani in its arguably core sense of acceding to international protocols to protect the environment; from the port's perspective of monitoring organisational and client emissions in the region, and providing waste facilities. These are part of port services.

The remaining aspects of Jeddah Islamic Port's 2016 – 2020 plan concerned shipping configurations (rise of mega-containers) and port competition in Egypt's Suez Canal and the establishment of private ports in the Kingdom. Whilst the Mawani representative was sanguine about Saudi Arabia capturing passing trade, the

Jeddah Islamic Port interviewee set high expectations for increasing export throughout and expanding the port. This entailed improving physical logistics of inland transport and storage, automation, and high performance outcomes.



*Main bulk refers to iron ore, grains, coal
[b] Tanker trade refers to oil, gas, chemicals

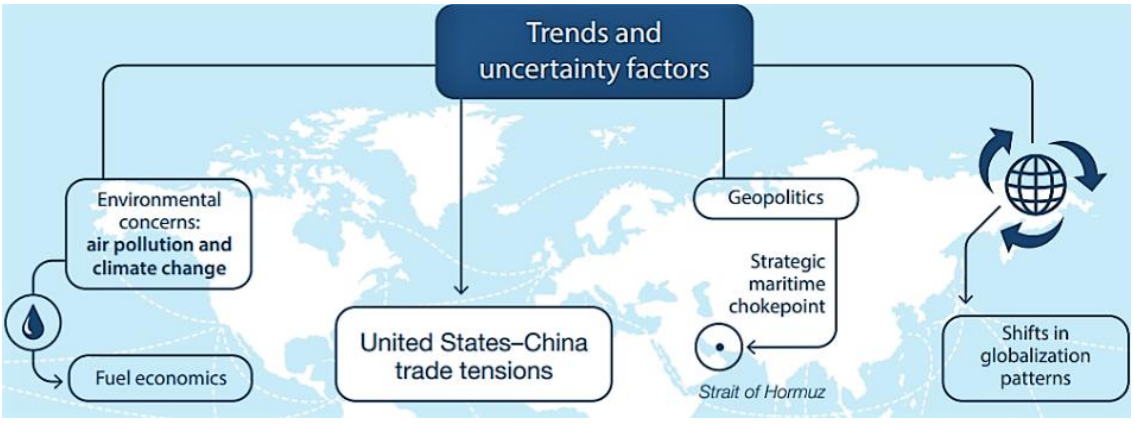
Source for figure: UNCTAD 2019 [2], p.5 (A), p. 2(B) (USA location).

Fig. 1. A. International maritime trade, selected years, million tons (USA) loaded, B. International port traffic 2018, by region.

Table 1. Top world container ports.

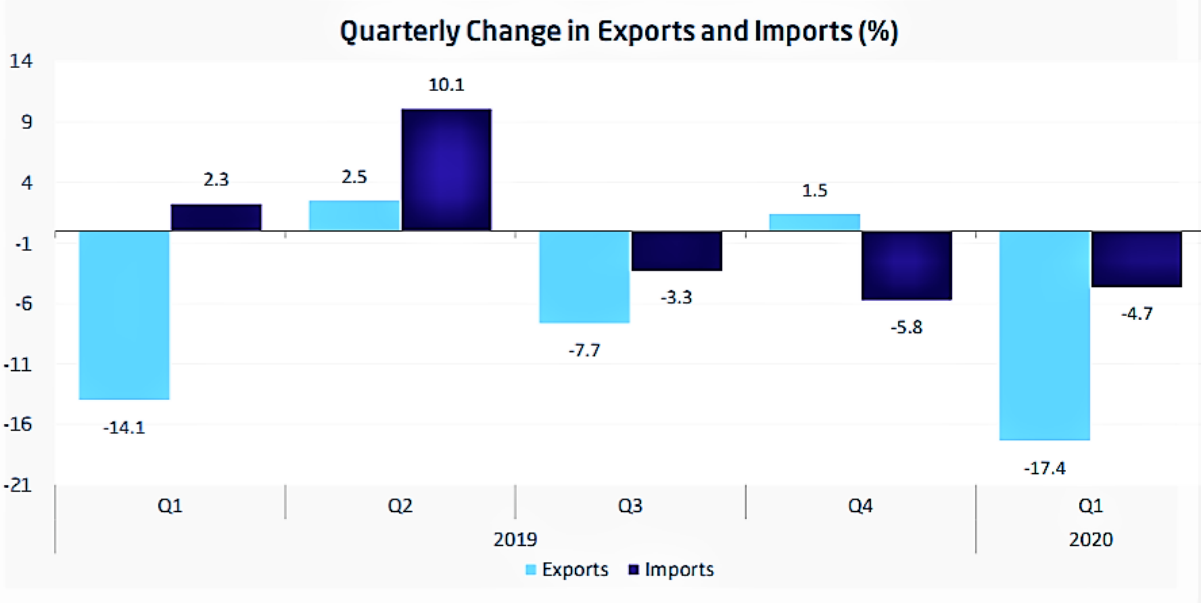
Rank	Port	2018 TEU m	2014 TEU m	Growth 5 years
1	Shanghai, China	42.01	35.29	1.2
2	Singapore	36.60	33.87	1.1
3	Shenzhen, China	27.74	24.03	1.2
4	Ningbo-Zhoushan, China	26.35	19.45	1.4
5	Guangzhou Harbor, China	21.87	16.16	1.4
6	Busan, South Korea	21.66	18.65	1.2
7	Hong Kong, S.A.R, China	19.60	22.23	0.9
8	Qingdao, China	18.26	16.62	1.1
9	Tianjin, China	16.00	14.05	1.1
10	Jebel Ali, Dubai, United Arab Emirates	14.95	15.25	1.0
11	Rotterdam, Netherlands	14.51	12.30	1.2
12	Port Klang, Malaysia	12.32	10.95	1.1
13	Antwerp, Belgium	11.10	8.98	1.2
14	Kaohsiung, Taiwan, China	10.45	10.59	1.0
15	Xiamen, China	10.00	10.13	1.0
16	Dalian, China	9.77	10.13	1.0
17	Los Angeles, U.S.A.	9.46	8.33	1.1
18	Tanjung Pelepas, Malaysia	8.96	8.50	1.1
19	Hamburg, Germany	8.73	9.73	0.9
20	Long Beach, U.S.A.	8.09	6.82	1.2
36	Jeddah, Saudi Arabia	4.12	4.20	1.0

Source: World Shipping Council 2020 [4].



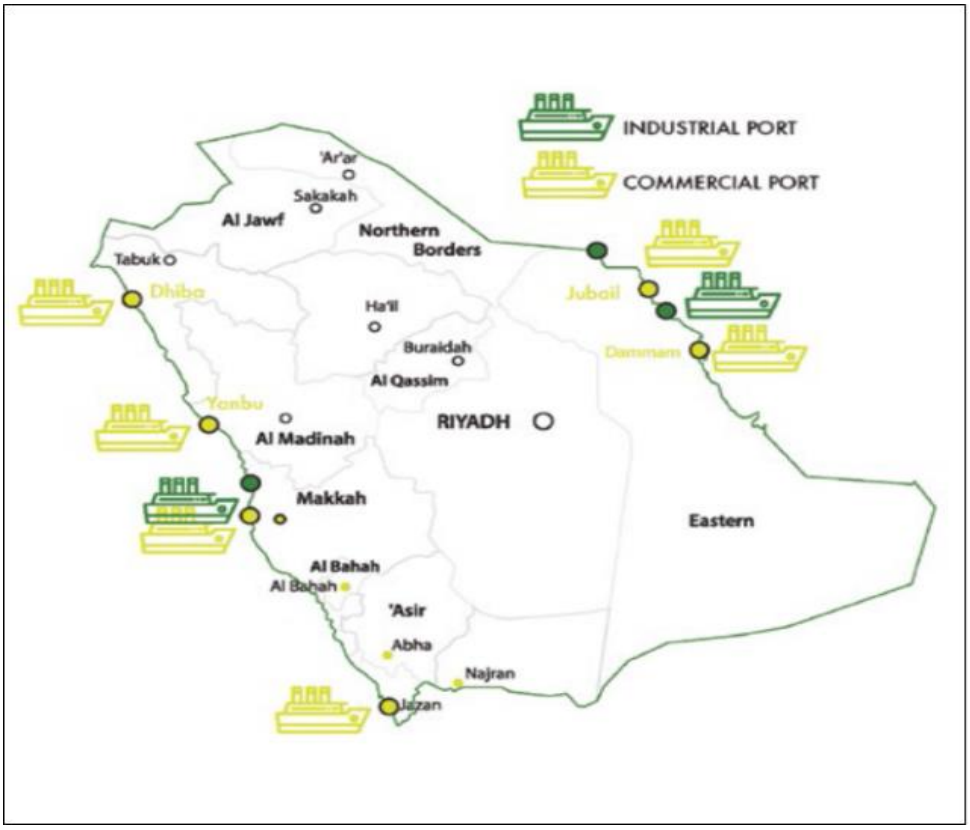
Source UNCTAD 2019 [2], p.2 (USA location).

Fig. 2. Pre-COROVID-19 global uncertainty factors.



Source General Authority for Statistics, 2020 [17].

Fig. 3. Effects of trade tensions and COVID-19 on Saudi foreign trade.



Note: Jeddah Islamic Port is located next to Makkah, King Abdullah Port at King Abdullah City
Source: Industrial Clusters, 2019 [26].

Fig. 4. Location of Saudi seaports at a glance.

Table 2. Jeddah port throughput 2019 (tonnes).

Cargo Type	Discharged	Loaded	Total
Bulk Cargo (Solid) *	5,623,716	10,800	5,634,516
Bulk Cargo (Liquid) **	417,722	0	417,722
General Cargo	1,134,391	317,417	1,451,808
Containers	25,678,090	20,752,741	46,430,831
Ro-Ro & Vehicles	841,689	184,961	1,026,650
Livestock	222,071	18	222,089
Total	33,917,679	21,265,937	55,183,616

Total Port Throughput	55,183,616

(* Includes: Sugar, Iron Ore, Coal, Cement, Urea, Sulpate)
(** Includes: Vegetable Oils, Animal Oils, Refined Oil Products, Liquid Petrochemica Products, Liquified Natural Gas)

Source Mawani [23,28].

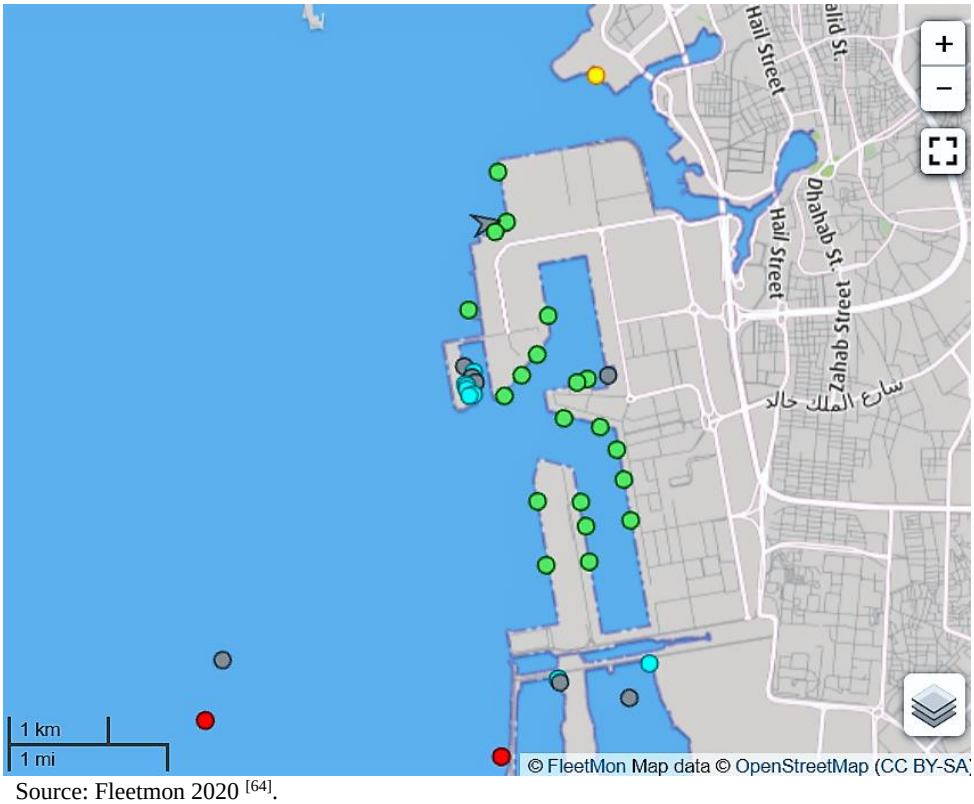
Table 3. Container shipping turnaround time.

Port call and performance statistics: number of arrivals, time spent in ports, vessel age and size, annual

Other: YEAR - 2018

MEASURE / ECONOMY	COMM. MARKET	Number of arrivals	Median time in port (days)	Average age of vessels	Average size (GT) of vessels	Average cargo carrying capacity (dwt) per vessel	Average container carrying capacity (TEU) per container ship	Maximum size (GT) of vessels	Maximum cargo carrying capacity (dwt) of vessels	Maximum container carrying capacity (TEU) of container ships
Saudi Arabia	All ships	16 951	1.3	12.0	48 352	82 503	7 297	214 286	323 183	19 630
	Passenger ship	2 813	..	14.0	4 074	..	..	24 727	..	..
	Wet bulk	6 525	1.5	11.0	61 070	112 282	..	172 146	323 183	..
	Container ship	3 669	0.8	11.0	80 721	..	7 297	214 286	..	19 630
	Dry breakbulk	835	1.7	21.0	10 489	14 365	..	46 909	80 500	..
	Dry bulk	1 464	4.5	8.0	33 153	58 127	..	107 666	209 067	..
	Roll-on/ roll-off ship	1 208	..	20.0	36 058	15 916	..	77 000	46 705	..
	Liquefied petroleum gas carriers	437	1.5	10.0	28 937	33 786	..	49 292	64 220	..
	Liquefied natural gas carriers	..	..	..	..	..	..	..	..	..

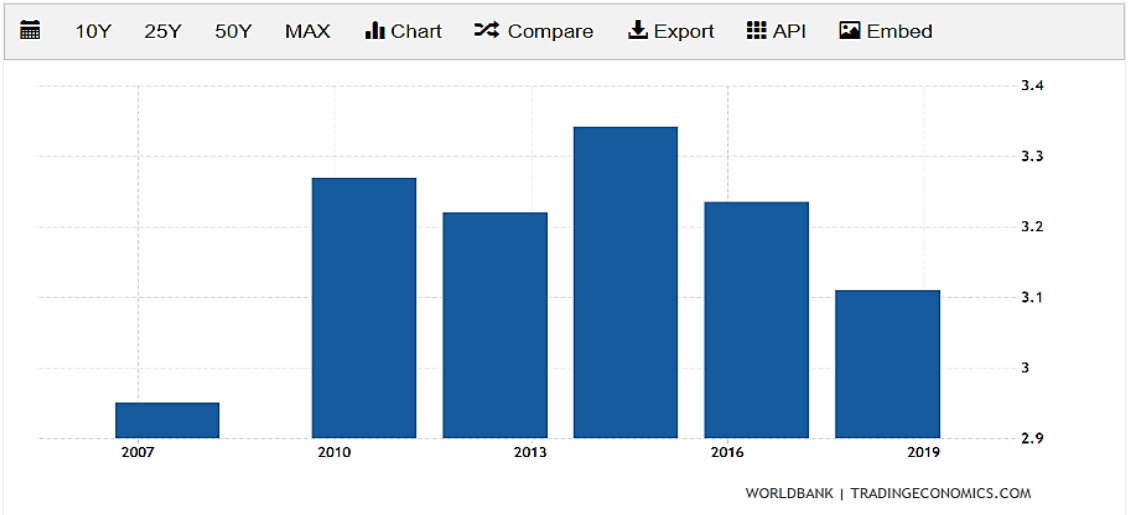
Source UNCTAD 2019 [2].



Source: Fleetmon 2020 [64].

Fig. 5. Ships waiting to enter Jeddah Islamic Port.

Logistics performance index: Quality of trade and transport-related infrastructure (1=low to 5=high) in Saudi Arabia was reported at 3.11 in 2018, according to the World Bank collection of development indicators, compiled from officially recognized sources. Saudi Arabia - Logistics performance index: Quality of trade and transport-related infrastructure (1=low to 5=high) - actual values, historical data, forecasts and projections were sourced from the World Bank on July of 2020.



Source: Trading Economics, 2020 [65].

Fig. 6. Saudi Arabia, Logistics performance index.

Table 4. Non-oil revenue as a percentage of GDP.

Key statistics						
	2016	2017	2018	2019	2020	2021
Economic output:						
Nominal GDP (SAR billion)	2,419	2,582	2,949	2,811	2,902	3,027
Nominal GDP y-o-y	-1.4%	6.7%	14.2%	-4.7%	3.2%	4.3%
Real GDP y-o-y	1.7%	-0.7%	2.4%	0.4%	2.3%	2.2%
Revenue (% of GDP)	21.5%	26.8%	30.7%	32.6%	28.7%	27.7%
Oil revenue (% of GDP)	13.8%	16.9%	20.7%	21.4%	17.7%	21.1%
Non-oil revenue (% of GDP)	7.7%	9.9%	10.0%	11.2%	11.0%	6.6%

Source: KPMG 2019, p.19 [66].

4. Conclusions

Jeddah Islamic Port is well positioned to achieve its aims. As part of President Xi's Belt and Road policy, it may consider organising relationships with Chinese ports, predominantly Shanghai, and Dubai is also integral to the port's strategy. As the port intends to engage its tenants (through concessions) in planning for 2030 and beyond, perhaps they are also in the position of engaging with their counterparts in Asian and Egyptian ports.

This case study illustrates the interdependencies of ports throughout the global value chains, and the urgent need to improve communications between them, particularly with direct trading partners such as Shanghai and Jeddah. Given policy opportunities or constraints, public or private ownership has a bearing on trade through imposition or release of trade barriers, however, individual seaports have latitude through their terminal operators to facilitate trade efficiencies.

Authors Contributions

All the authors contributed the conceptualization, data processing, writing and editing of the manuscript.

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Conflicts of Interest

The authors declare no conflict of interest.

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ميناء جدة الإسلامي: استراتيجيات الاستجابة للصدمات الاقتصادية المحتملة للفترة ٢٠٢٠-٢٠٣٠

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المستخلص. جدة هي البوابة البحرية للقلب التجاري للمملكة العربية السعودية، وهناك توقعات كبيرة من الميناء لزيادة مساهمته بشكل كبير في الناتج المحلي الإجمالي غير النفطي. ومع ذلك، جاءت القضايا الجيوسياسية بين الولايات المتحدة الأمريكية والصين، ثم جائحة COVID-19 التي ستؤثر بشكل كبير على التجارة العالمية. تبحث هذه الدراسة في آثار هذه الظروف وارتفاع المنافسة المينائية على سياسة الحكومة (رؤية ٢٠٣٠) لميناء جدة الإسلامي. من خلال إجراء مقابلات مع المشاركين الرئيسيين في المجالات العامة والخاصة. يوضح هذا البحث المقاييس الإحصائية، ويراجع بشكل نقدي المعلومات من العديد من المصادر لتحديد الوضع الحالي لميناء جدة الإسلامي. تتم حالياً معالجة الاختناقات الكبيرة في اللوجستيات البرية، مثل مرافق الطرق والتخزين. تم اعتماد التطورات الحالية في الرقمنة في منصة لوجستية لسلسلة التوريد تركز على الميناء، مع خطط لتحميل الحاويات وتفريغها وأتمتة التخزين في الموقع. تعتبر الاستدامة من قبل شركة موانئ (أي هيئة الموانئ) على أنها تلبي البروتوكولات الدولية بشأن الانبعاثات والنفايات. ومع ذلك، فإن صعود سفن الحاويات الضخمة، وتحسن حركة قناة السويس، وهيمنة الشحن الصيني، ضغط على مديري الموانئ للتواصل مع مستأجري الموانئ ومع الموانئ الأجنبية لضمان بقاء ميناء جدة الإسلامي لاعباً رئيسياً في تجارة العالم. تم العثور على الاتصالات بين الموانئ لتكون ممارسة تجارية حاسمة في مواجهة المنافسات الناشئة في المنطقة.

الكلمات المفتاحية: رؤية ٢٠٣٠، هيئة الموانئ، جدة، بوابة الشرق الأوسط.