

Transport Network in the Middle East Region: A Spatial Analysis

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Abstract: *This paper entitled with Transportation network in Middle East region: A spatial analysis, deals with development of the different modes of transportation in the Middle East region as transportation is the key factor for the development, it also provides the essential links between origin and destination areas. Middle East region's has excellent geographic location and a very good accessibility by air, land and sea. The government of Middle East countries over time initiated many polices, regional cooperation's and plans for the development of better transportation network within the region. This region has a strategic location for the global trade which has benefited the economy and brought prosperity within the region.*

Keywords: Development, Transportation, Regional Transport Policy, Middle East, Network, Corridor.

1. Introduction

Transport is amongst the most important factor for the development of a country or a region. It is a process of transacting good and services between places. Globally the transport system has diverse mode of movement which had evolves through time and techniques. Today the modern transport system had not only reduced the cost, time and energy but had played the most important role for the development of a society, a country or a region

In the ancient times, a horse, a horse and an ox carriage carts boat etc were the common modes of transport used by travellers. The industrial revolution in the sixteen century brought about significant changes in the modes of transportation used by people. Introduction of railways, motorcars and thereafter Aero planes revolutionized transport system globally. The discovery and application of steam and electricity in the nineteenth century and the internal combustion engine in the twentieth century revolutionized travel and transport and introduced the present era of mass transport. The next spectacular breakthrough came in the late 1950 with the propulsion of aircrafts with jet engines bringing the immense benefits of air travel to the whole world.

Transport is the key factor for the development; it provides the essential link between origin and destination areas. Earlier travel was undertaken for trade, commerce and religion. Advancement in transportation technology brought about road improvement and development of other means of transport. Broadly the transport Network can be classified into five different categories as:

- Road Transport (Paved and unpaved roads etc)
- Rail Transport (Railways, Metro & Mono Rails etc)
- Water Transport (Through Port, Ships etc)
- Air Transport (Domestic & International flight etc)
- Pipelines (Gas and Petroleum Pipelines etc)

The nature and the different modes of the transport system operating within a territory depend upon numerous factors like; Physical Factor (Physiography, Climatic condition, Mineral Resources, Ports, etc, Economic Factors (National Income, Markets, Industrial Regions, cheap labour etc.), Human factors (Demographic conditions, Religious, health, Tourism and other social factors), Political Factor (Governance, Constitution, Planning and willingness by the government, Peace, Alliances and Agreements between territories etc), Technological Factors (Machine tools, equipment, technological skill and knowledge) etc

2. Road Transport

After the World Wars II, the world was divided mainly into two blocs: Western countries with market economies and Eastern countries, including China, with planned economies. There was therefore no global economic policy. After the end of the Cold War 1990, economic development has been driven by globalization. This globalization process – together with the enormous differences between all these liberalized national economies with regard to knowledge, the availability of raw materials and social costs has lead to a dramatic increase in trade and transport. The historic Silk Road demonstrates clearly that road transport is always at the disposal of everyone, everywhere, to unite people and to better distribute wealth. The Governments across the world with its improve knowledge, share experience, conventions and other regional legal instruments developed in the last 60 years, had tried its best to facilitate road transport and trade everywhere but in particular in the Middle East region, which is a cradle of civilizations, a melting point of different cultures and a major alternative trade route for international transit traffic between East and West. Despite continuous efforts to upgrade, modernize and expand the size of the road network in most Arab countries, the road network suffers from poor maintenance and does not accommodate the needs of a modern economy and efficient land transport, especially in the poorer Arab countries. Efforts are also being made to develop new road networks in order to connect remote areas to cities and major economic areas and

to find solutions to the extensive Congestions in major cities and capitals of many Arab states, such as the cities of Tunisia, Dubai, Cairo, Beirut, etc. Such efforts also include building new roads, bridges, over and underpasses, etc. In terms of physical capacity, the road network provides the primary means for passenger and goods transportation within Arab states.

Table 1: Road Transport Statistics of Middle East 2012

Country	Land Area (Sq.Km)	Total Population	Roads Paved (%of total Roads)	Passenger Cars (Per 1000 People)	Vehicles (Per Km of Roads)
Algeria	2,381,740.00	35,980,193	74	74	35
Bahrain	760	1,323,535	82.1	451	104
Cyprus	9,240.00	1,116,564	64.9	529	48
Egypt	995,450.00	82,536,770	89.4	33	37
Iran	1,628,550.00	74,798,599	NA	113	51
Iraq	434,320.00	32,961,959	NA	NA	NA
Israel	21,640.00	7,765,700	100	265	128
Jordan	88,780.00	6,181,000	100	113	117
Kuwait	17,820.00	2,818,042	NA	412	212
Lebanon	10,230.00	4,259,405	NA	NA	NA
Libya	1,759,540.00	6,422,772	NA	225	NA
Morocco	446,300.00	32,272,974	70.3	53	NA
Oman	309,500.00	2,846,145	46	166	NA
Qatar	11,590.00	1,870,041	NA	NA	NA
Saudi Arabia	2,149,690.00	28,082,541	NA	NA	NA
Syrian Arab Republic	183,630.00	20,820,311	90.3	30	20
Tunisia	155,360.00	10,673,800	75.2	76	61
Turkey	769,630.00	73,639,596	88.7	95	29
United Arab Emirates	83,600.00	7,890,924	NA	293	NA
West Bank and Gaza	6,020.00	4,019,433	91.7	25	22
Yemen Republic	527,970.00	24,799,880	NA	NA	NA

Source: United Nations Publications

Main International Road Transport Corridors in Middle East

- M5 Zakho (Turkey) – Mosul – Baghdad – Al-Samawah – Basrah –
- Kuwait – Abu Hadriyah – Damman – Manama OR Hufuf – Salwah – Bathaa –
- Al-Ghweifat – Abu Dhabi – Dubai – Fujaira – Sohar – Muscat – Nizwa – Thumrayt
- M7 and M9 Abu Dhabi – Mazyad – Nizwa
- M10 Hajj Omar – Irbil – Mosul – Rabiyyah – Yaaroubia – Kamishli – Aleppo – Ariha – Lattakia
- M15 Aleppo – Deir Ez-Zor – Ramadi
- M20 Kamishli – Hasaka – Deir Ez-Zor – Homs – Tartous
- M25 Abu Hadriyah – Hafar El-Batin – Arar – Hadithat – Al-Azraq
- M30 Beirut – Damascus – Al-Rutbah
- M35 Amman – Al-Azraq – Sakakah – Haif – Buraydah – Riyadh – Al-Kharj
- M40 Baghdad – Ramadi – Al-Rutbah – Al-Azraq – Jerusalem – Gaza – Arish – Kantara Bridge – Port Said – Demiat – Alexandria – Salum
- M45 Taizz – Sanaa – Baqim – Elb – Abha – Mecca – Medina – Qalibah – Tabuk
- Al-Mudawara – Maan – Amman – Damascus – Homs – Aleppo – Bab Al-Hawa – Turkey.
- M50 Baghdad – Karbala – Al-Nukhaib – Arar Sakaka – Qalibah – Tabuk – Halat Ammar – Ad-Durra – Aqaba – Nakhel – Shatt – Suez – Cairo
- M51 Kassab – Lattakia – Tartous – Tripoli – Beirut – Naqoura
- M55 Al-Mukha – Hodeidah – Harad – Al-Tuwal – Darb – Jeddah – Rabigh – Yanbu – Dhuha – Ad-Durra – Aqaba – Nuweiba – Nakhel – Arish
- M65 Ismailia – Suez – Hurdagha – Safaga – Halayeb.
- M67 Ismailia – Cairo
- M70 Kuwait – Hafar El-Batin – Artawiyah – Buraydah – Medina – Yanbu.
- M75 Ismailia – Cairo – Qena – Luxor – Arqin
- M80 Manama – Dammam – Riyadh – Mecca
- M90 Doha – Abu Samra – Salwah – Bathaa – Harad – Al-Kharj – Sulayil –

3. Other Modes of Transportation

3.1 Railway

The railway network in the Arab world passes through 11 countries: Mauritania, Morocco, Algeria, Tunisia, Egypt, Sudan, Lebanon, Syria, Jordan, Iraq and the Kingdom of Saudi Arabia. The gross length of the network (data from year 2001) is approximately 25.3 thousand km, of which only 15.8 thousand km has the standard width of 1,435 mm. The length of the double-track network is about 2,600 km, and the length of the electrified lines is about 1,400 km, while the rest is a single track.

In general, the railway network suffers from its limited expansion and lack of connectivity in many parts of the region, in addition to its poor maintenance which renders its services inefficient and below ambitions of modernity and efficiency. Also, the capacity of the railway network is limited by the heterogeneity of its technical specifications.

Table 2: Existing Railways Networks in the Middle East Regions

Country	Railways
Algeria	Total: 3,973 km, standard gauge: 2,888 km 1.435-m gauge (283 km electrified) narrow gauge: 1,085 km 1.055-m gauge (2008)
Bahrain	No Railways
Cyprus	
Egypt	Total: 5,083 km, standard gauge: 5,083 km 1.435-m gauge (62 km electrified) (2009)
Iran	Total: 8,442 km, broad gauge: 94 km 1.676-m gauge standard gauge: 8,348 km 1.435-m gauge (148 km electrified) (2008)
Iraq	total: 2,272 km, standard gauge: 2,272 km 1.435-m gauge (2008)
Israel	Total: 975 km, standard gauge: 975 km 1.435-m gauge (2008)
Jordan	Total: 507 km, narrow gauge: 507 km 1.050-m gauge
Kuwait	Data Not Available
Lebanon	Total: 401 km, standard gauge: 319 km (1.435-m gauge) narrow gauge: 82 km (1.050-m gauge)
Libya	Data Not Available
Morocco	Total: 2,067 km, standard gauge: 2,067 km 1.435-m gauge (1,022 km electrified) (2008)
Oman	No Railway
Qatar	No Railway
Saudi Arabia	Total: 1,378 km, standard gauge: 1,378 km 1.435-m gauge (with branch lines and sidings) (2008)
Syrian Arab Republic	Total: 2,052 km, standard gauge: 1,801 km 1.435-m gauge, narrow gauge: 251 km 1.050-m gauge (2008)
Tunisia	Total: 2,165 km, standard gauge: 471 km 1.435-m gauge, narrow gauge: 1,694 km 1.000-m gauge (65 km electrified) (2008)
Turkey	Total: 8,699 km, standard gauge: 8,699 km 1.435-m gauge (1,928 km electrified) (2008)
United Arab Emirates	Data Not Available
West Bank and Gaza	NA
Yemen Republic	NA

Here we see that the railway track network is maximum in countries like Iran, Turkey, Egypt and Algeria, while Tunisia, Syria, Iraq and Morocco have an average network

(1900-2300 km track). Countries like Saudi Arabia with a huge size have a poorly developed railway track. Israel which is amongst the highly developed countries of Middle East also have a low railway network due to its size and internal conflicts. Lebanon, Jordan, UAE etc are amongst the countries with a very low railway network.

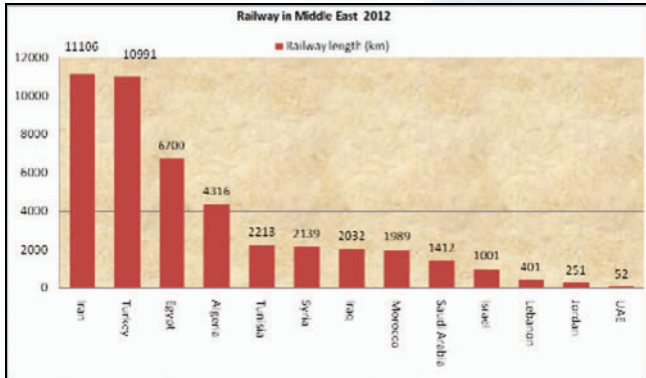


Figure 1: Railway in Middle East

The dependency ratio of population and railway network is extremely poor in countries like UAE, Jordan, Lebanon, Saudi Arabia where more than 90% gap can be noticed. Israel, Morocco, Iraq Syria are having a gap of 80-90% while Tunisia, Algeria, Egypt have a moderate gap. In Turkey and Iran a fair ratio can be noticed, which shows the developed rail network in these countries for its population.

Main Railway Corridors in the Middle East Region

East-West Routes

- R90 South Arabian Peninsula: Bab El-Mandab – Aden – Al-Mukhalla – Geizah – Shahan – Mazayunah – Thumrayt
- R82 Doha: Doha – Salwah
- R80 Jubeil – Jeddah: Jubeil – Dammam – Hufuf – Riyadh – Jeddah
- R70 Safaga – Al-Kharja: Safaga – Qena – Al-Kharja
- R60 Maán – Verdun: Maán – Aqaba – Nuweiba – Nakhel – Verdun Bridge
- R50 Mediterranean Southern Coast – Nile Delta: Rafah – Port Said – Verdun Bridge – Ismailia
- R40 West Iraq – Jordan: Haklania – Tarabil – Karamah – Al-Azraq – Zarqaá
- R30 Damascus – Beirut: Damascus – Masna – Beirut
- R20 Middle Syria: Kamishli – Hasaka – Deir Ez-Zor – Tadmor – Maheen – Homs – Akkary – Tartous
- R10 Iraq – East Mediterranean: Khanaqin – Baghdad

North-South Routes

- R05 Iraq – East Arabian Peninsula: Yaaroubia – Mousul – Baghdad – Al-Samawah – Nasiriyah – Basrah – Umm Qasr – Kuwait – Abu Hadriyah – Jubail – Dammam – Salwah – Bathaá – Al-Ghweifat – Abu Dhabi – Dubai – Fujairah – Kalba – Sohar – Muscat – Thumrayt – Salalah
- R15 Middle Arabian Peninsula: Riyadh – Buraydah – Hail – Abu Ajram – Quorayat – Al-Azraq
- R25 Syria – Jordan – Saudi Arabia – Yemen: Midan Ikbis – Aleppo – Homs – Maheen – Damascus – Daraá – Zarqaá – Amman – Maán – Al-Mudawara – Halat Ammar – Tabuk – Medina – Jeddah – Darb – Harad – Hodeidah – Al-Muakha
- R27 Homs – Riyyaq
- R35 East Mediterranean: Lattakia – Tartus – Tripoli – Beirut – Tyr
- R45 Nile Valley: Cairo – Qena – Aswan – Wadi Halfa

East-West Routes

4. Water Transport

Sea Ports

As the Arab world is geographically at the heart of the “ancient world”, and has a strategically important location in the routes of international trade transport, many Arab countries are renovating and expanding their sea ports, with the aim of becoming regional logistics hubs for international and regional trade transport.

Main Sea Ports in the Region

- **Algeria:** Alger, Annaba, Arzew, Bejaia, Beni Saf, Bethioua, Chazaouet, Cherchel, Chetaibi, Collo, Dellys, El-Kala, Jijel, Mers El-Kebir, Mostaganem, Oran, Skikda, Tenes, Tipasa.
- **Bahrain:** Al-Manamah Harbor, Mina Sulman, Sitrah.
- **Egypt:** Abu Zanimah, Adabiya, Ain Sukha Terminal, Alexandria, Al-Ghudaqah, Al-Qusayr, As-Sallum, Bur Safaga, Damietta, Dekheila, El-Hamra Oil Terminal, El-Ismailia, Geisum, Matruh, Port Said, Ras Gharib, Rashid, Ras Shukheir, Sidi Kerir, Suez, Wadi Feiran , Zeit Bey Terminal.
- **Iraq:** Al-Basarah, Al-Faw, Khawr Al-Amaya, Mina Al-Bakr, Umm Qasr.
- **Jordan:** Al-Aqaba
- **Kingdom of Saudi Arabia:** Dammam, Jeddah, Jizan, Juaymah Oil Terminal, Jubail, King Fahid, Ras Al-Khafji, Ras Al-Mishab, Ras At-Tannurah, Yanbu.
- **Kuwait:** Al-Kuwait, Ash-Shuaibah, Mina Abdallah, Mina Al-Ahmadi, Mina Az-Zawar.
- **Lebanon:** Beirut, Tripoli.
- **Libya:** As-Sidr, Banghazi, Darnah, Marsa Al-Burayqah, Marsa Al-Hilal, Marsa Sabrakah, Marsa Susah, Misrakah, Ras Lanuf, Tripoli, Tubruq, Zawia Oil Terminal, Zeitina, Zuwarah.
- **Morocco:** Agadir, Alcazar, Casablanca, Essaouira, El-Jadida, Larache, Mehdiya, Mohammedia, Port Nador, Rabat, Safi, Tanger.
- **Oman:** Mina Al-Fahl, Mina Qabus, Mina Raysut.
- **Qatar:** Ad-Dawhah, Jazirath Halul, Umm Said (Musayid).
- **Syria:** Al-Ladhiqiyah, Baniyas, Tartus.
- **Tunisia:** Al-Muhdiyah, As-Sukhayrah, As-Suq, Banzart, Burj Qulaybiyah, Gabes, Halq Al-Wadi, Hawmat Souse, Ras Sidi Abd Allah, Sfax, Tabarqah, Taserka, Tunis.
- **United Arab Emirates:** Abu Al-Bu-Khoosh, Abu Dhabi, Al-Hamriyah, Arzanah Island Port, Ash-Shariqah, Az-Zannah Ruways, Das , Dubai, Fateh Terminal, Fujayrah Harbor, Khawr Fakkan, Mina Jebel Ali, Mina Saqr, Mubarraz Oil Terminal, Sharjah Offshore Port, Umm Al-Qaywayn, Umm An-Nar.
- **Yemen:** Aden, Ahmadi, Al-Mukalla, Kamaran, Ras Isa Terminal.

5. Air Transport System

To benefit from the strategic geographic location of the Arab world, many Arab states are modernising their existing airport infrastructure and facilities, and building new airports, with the aim of becoming regional and international hubs for freight and passenger movements. Despite the availability of high standards airports and modern fleets, the demand for air transport in the Arab world remains larger than the prevailing capacities

Table 3: Airports and Heliports in Middle East - 2012

Country	Airports (Total)	Airports (Paved Runway)	Airports (Unpaved Runways)	Heliports
Algeria	142	60	82	3
Bahrain	4	4	0	1
Cyprus	15	13	2	9
Egypt	84	72	12	6
Iran	324	136	188	21
Iraq	104	75	29	20
Israel	47	29	18	3
Jordan	18	16	2	1
Kuwait	7	4	3	4
Lebanon	7	5	2	0
Libya	144	64	80	2
Morocco	56	31	25	1
Oman	130	12	118	3
Qatar	6	4	2	1
Saudi Arabia	216	80	136	10
Syrian Arab Republic	99	29	70	6
Tunisia	29	15	14	0
Turkey	98	89	9	20
United Arab Emirates	42	25	17	5
West Bank and Gaza	2	2	0	0
Yemen Republic	57	17	40	0

The above data and charts show the advancement of Air Transport system within the Middle Eastern region. Iran has highest numbers of Airport but majority is unpaved, same goes to Saudi Arabia, Algeria, Oman, Syria and so on. The number of Heliports is quite high in countries of Iran, Iraq, Turkey, and Saudi Arabia. There are countries without Heliports like Lebanon, Tunisia, Yemen etc. The highest Air Transport , Registered Carrier departures worldwide can be seen in Turkey and United Arab Emirates, while the moderate situation can be seen in the countries of Saudi Arabia, Iran, Egypt, Morocco and Qatar.

6. Pipeline Transport

Pipeline transport is the process of transportation of goods through a pipe. Mainly , liquids and gases are sent,. Chemically stable substance can also be sent through a pipeline. Therefore sewage, slurry, water, or even beer pipelines exist; but arguably the most valuable are those transporting crude petroleum and refined petroleum product including fuels: oil (oleoduct), natural gas (gas grid), and biofuels. Oil pipelines are the cheapest method of transporting oil where they are available. Where the

alternative of sea going veseels is not available, for example when the oil is produced in a land locked country, then the alternatives to pipelines are very much more expensive. Pipelines have the major disadvantages that they are vunerable to sabotage, they require significant capital cost and time to build, and they are the least flexible option. Where a pipeline crosses a number of countries, the geopolitical problems can be very significant.

Table 4: Pipeline in Middle

Country	Pipelines
Algeria	Total condensate 2,600 km; gas 16,360 km; liquid petroleum gas 3,447 km; oil 7,611 km; refined products 144 km (2010)
Bahrain	gas 20 km; oil 29 km
Cyprus	0 km
Egypt	condensate 320 km; condensate/gas 13 km; gas 6,628 km; liquid petroleum gas 956 km; oil 4,332 km; oil/gas/water 3 km; refined products 895 km; water 13 km (2010)
Iran	condensate 7 km; condensate/gas 12 km; gas 20,155 km; liquid petroleum gas 570 km; oil 7,123 km; refined products 7,937 km (2010)
Iraq	gas 2,447 km; liquid petroleum gas 918 km; oil 5,104 km; refined products 1,637 km (2010)
Israel	gas 211 km; oil 442 km; refined products 261 km (2010)
Jordan	gas 439 km; oil 49 km (2010)
Kuwait	gas 269 km; oil 540 km; refined products 57 km (2010)
Lebanon	gas 102 km (2010)
Libya	condensate 776 km; gas 3,216 km; oil 6,960 km (2010)
Morocco	gas 830 km; oil 439 km (2010)
Oman	condensate 107 km; gas 4,209 km; oil 3,558 km; refined products 263 km (2010)
Qatar	condensate 145 km; condensate/gas 132 km; gas 980 km; liquid petroleum gas 90 km; oil 382 km (2010)
Saudi Arabia	condensate 212 km; gas 2,846 km; liquid petroleum gas 1,183 km; oil 4,232 km; refined products 1,151 km (2010)
Syrian Arab Republic	gas 3,161 km; oil 1,997 km (2010)
Tunisia	gas 2,386 km; oil 1,323 km; refined products 453 km (2010)
Turkey	gas 10,706 km; oil 3,636 km (2010)
United Arab Emirates	condensate 458 km; refined products 212 km; gas 2,352 km; liquid petroleum gas 220 km; oil 1,437 km (2010)
West Bank and Gaza	NA
Yemen Republic	gas 423 km; liquid petroleum gas 22 km; oil 1,367 km (2010)

7. Regional Transport Policy

Major transport policy centers in the Arab world are:-

- UN-ESCWA (Economic and Social Commission for Western Asia)
- The League of Arab States
- The Gulf Cooperation Council (GCC)
- Council of Arab Economic Unity
- Arab Union of Land Transport (AULT)
- Arabs Union of Railways
- The Arab Sea Ports Federations (ASPF)
- Arab Federation of Chambers of Shipping
- Arab Federation of Chambers of Shipping
- Arab Federation of Shipping
- Arab Air Carriers Organisation
- Arab Civil Aviation Organisation

- Arab Civil Aviation Commission
- The IRU Permanent Delegation to the Middle East & Region

The Arab states have engaged in several bilateral and multilateral agreements to regulate the transport of passengers and goods between them via the different modes of transport, with the aim to promote further integration among them. The major agreements are stated below:

- Decree of the Arab Agreement to Regulate Passenger Land Transport in between and across the Arab Countries
- ESCWA Agreements
- International Agreement on Roads in the Arab Mashreq
- International Agreement on Railways in the Arab Mashreq
- Memorandum of Understanding on Cooperation in Maritime Transport in the Arab Mashreq
- Convention on International Multimodal Transport of Goods in the Arab Mashreq
- UNECEC Convention
- Arab Transit System
- T I R System

It also targets areas of action including promoting scientific and technological advancement in the sectors of manufacturing and mining, agriculture and animal herds, as well as establishing joint scientific research centres and promoting partnership with the private sector. In the field of transport, the GCC member states have set various codes to regulate a joint transportation system, in order to facilitate transportation of goods and passengers between them. The GCC directorate established a system for transit transport across the GCC, as an outcome of the Unified Economic Agreement which coordinates the economic and trade relations between the GCC member states.

8. Conclusion

The Middle East region is in the middle of exciting global, regional and local developments in terms of transport. Beginning of the first century AD, the Silk Road brought intense trade and enormous wealth to the region, and the fundamental drivers for this traffic have not changed since then. As a result a rapid development will occur in the field of road and rail transport. But the advent of air transport this makes as a mass development in all the transportation sectors and the economy of this region. The process of globalization will come together with the enormous differences between all these liberalized national economies with regard to knowledge, the availability of raw materials and social costs will lead to a dramatic increase not only in trade and transport but also in specific customer demand and competition. Road transport in a liberalized and globalised economy has become an efficient and irreplaceable production for the economic growth of the Middle East countries. The Middle East countries in Western Asia and North Africa can and should integrate their economies within the region and to the global economy by further facilitating international road Benefitting from an increasing

portion of world trade, the major Arab ports in the Gulf region can only seize the new opportunities of tremendous growth if they are supported by efficient, reliable and professional road transport services in their hinterland. Government of Middle Eastern countries should embark on a well defined development strategy for the transportation sector which provides the rapid growth in the field of transportation. The long and short term strategic will play a very important role in Middle East region.

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