

THE INTERNATIONAL UNION OF RAILWAYS

THE RAILWAYS OF THE MIDDLE EAST “VISIONS 2025”

Background paper, UIC strategy



February 2008

“Adequate transport infrastructure and efficient services are fundamental ingredients to building trade with other countries, reducing congestion in the region’s major cities, and increasing access and affordability.”

*(Transportation MENA,
The World Bank, net pages, January 2008)*

1 Introduction

The paper is a start-up document concerning UIC's future strategies for the Middle East Railways. It is a framework for further work and not a detailed study of each country. In most chapters, several countries are mentioned by names. The purpose of country specific information is only to show examples, not to generalize or to prioritize among countries. Other countries, than mentioned, can be in the same situation or having the same opportunities.

The term "Middle East" is often used in the report, well knowing that the Middle East countries and regions are not homogenous.

Furthermore, the intention is not to be complete. We are aware of that other issues, than presented in the report, could have been taken into consideration. The analysis is based on global tendencies as well as regional input. All global tendencies may be applicable for the Middle East. However, we believe that the most important issues are included even though some are more thoroughly discussed than others.

Information obtained from the railways of the Middle East is of different quality and for some countries satisfactory figures have not been possible to obtain during the project period. During the next phases of UIC's strategic work for the Middle East railways, the information should be assessed and refined through UIC's organizational network and according to future requirements

This paper is prepared for the International Union of Railways by a working group reporting to UIC's Deputy Chief Executive Mr. Vipin Sharma and UIC's Director of Communication Mr. Paul Veron. The project manager is Mr. Stig Nerdal. The project team consists of staff from Transportutvikling AS; Mr. Kjell Heggelund and Mr. Jan Terje Henriksen. During the working period, the project team has been assisted by various organizations and individuals.

The Railways in Iran (RAI), Saudi Arabia (SRO) and Turkey (TCDD) have offered valuable support and assistance during the project period.

The study has been made during January 2007 through February 2008.

We hope this document will be used in accordance with the intentions, -as a background paper and a contribution to a positive development for the Middle East railways.

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Acronyms and abbreviations

ADB	Asian Development bank
ALTID	The Asian Land Transport Infrastructure Development Project
AON	Corporation providing Risk Management and other services
BBL	Billions of barrels
CAS	Central Asian Countries
CFH	Hedjaz railways Syria (Chemins de Fer du Hedjaz)
CFS	Syrian Railways (Chemins de fer Syriens)
CIS	The Commonwealth of Independent States
CMO	The Conference of Middle East Railways
COSCO	China Ocean Shipping Company (Group)
EIA	Energy Information Administration (Official Energy Statistics from the U.S. Gov.)
END	Environmental Noise Directive
EU	The European Union
FDI	Foreign Direct Investments
GDP	Gross Domestic Product (various definitions)
HJR	Hedjaz Jordan Railways
ICT	Information and Communication Technology

IEWTC	The International East West Transport Corridor
IMF	The International Monetary Fund
INSTC	The International North South Corridor
IPCC	The Intergovernmental Panel on Climate Change
IRR	Iraq Republic Railway
KLM	Royal Dutch Airlines
kWh	Kilowatt-hour (1 000 watt-hours)
LDC	Least Developed Countries
MARMARAY	Fixed connection between Asia and Europe through the southern part of the Strait of Istanbul
MENA	The Middle East North Africa Region
OCFTC	Railway and Public Transportation Authority, Lebanon ("Office des Chemins de Fer et des Transports en Commun)
OECD	The Organization for Economic Co-operation and Development
PPP1	Purchasing power parities
PPP2	Public Private Partnerships
PTA	Preferential Trade Area
RAI	The Islamic Republic of Iran Railways
RTA	Regional Trade Agreements
SAS	Scandinavian Airline Systems
SCM	Supply Chain Management
SRADP	The Silk Road Area Development Programme
SRO	Saudi Railway Organization
TAR	Trans Asian Railways network
TCDD	Turkish State Railways
TEU	Twenty Foot Equivalent Unit
TGV	High Speed Train
TPEC	Total Primary Energy Consumption
TRACECA	Transport Corridor Europe-Caucasus-Asia
TU	Transportutvikling AS
TwH	Terawatt-hour (1 000 000 000 000 watt-hours)
UIC	The International Union of Railways
UN	The United Nations
UNCTAD	The United Nations Conference on Trade and Development
UNEP	The United Nations Environment Programme
UNESCWA	The United Nations Economic and Social Commission for Western Asia
UNESCAP	The United Nations Economic and Social Commission for Asia and the Pacific
UNPD	The United Nations Population Division
USD	United States Dollar
USDOT	The U.S. Department of Transportation
WCO	The World Customs Organization
WTO	The World Trade Organization

3 Executive summary

Background

The preparation of a UIC strategy for the Middle East railways should be developed after a common vision for these railways. A vision document is not a plan. It is background document for future strategies and work. It is also required to be descriptive and not too detailed, since the document may be read by organizations which are not a part of the "railway community", but still important for the development of the railways.

The relationships between transportation and economic/socio-economic conditions are very complex and often poorly understood. Some of these relationships are also clearly circular. The project work is to a large extent based on second hand macro data produced by serious global organizations like UIC, United Nations, World Bank, IMF etc. Macro data like population- and GDP growth are considered most important. The perspective in time is 2025.

Furthermore, prospect for the future based on these macro variables may be restricted by other conditions, like country specific issues. To some extent, international trends are applied to the Middle East.

It is not an objective, and it is not possible, to produce exact data for the future. The ambitions are to generate some information and initial guidelines for UIC's further work in the Middle East, together with its members and partners. The purpose is not necessarily to pinpoint the most likely future actions, but to highlight some of the forces that push the future in different directions.

The list of drivers will never be complete and analysts will have different views. For the purpose of looking into the railways future, freight and passengers, the main focus have been put on variables which is possible to identify, quantify and rank, -like GDP, energy, population etc. We would like to emphasize that the chapter "Other conditions" could have discussed other subjects than mentioned.

The Middle East railways and drivers impacting the future

Over the last years, the railway production in the Middle East has shown stable output for some countries and more volatile output for others. For some countries the market share has declined, their assets have deteriorated and their quality of service has been reduced. Like in Asia, many of the publicly-owned railways have financial challenges. These important transport links are struggling to meet growing demand, keep up with technological change, facing competition from other modes and competing for funding with other important public priorities. The Middle East have several competitive challenges like political and economical instability, growing population, trade barriers, lack of infrastructure investments and integration, trade imbalance and lack of management procedures.

However, this is not a homogenous picture. The countries of Middle East are heterogeneous. Middle East has populated and less populated countries, they have rich and poor countries, open and closed economies, growing and declining indicators, improving democracies and countries where human rights are violated. Each emerging market has different conditions that need to be accommodated. Despite many common challenges, it is not proper to consider Middle East as a homogenous region.

Railways are important comprehensive transport networks that are urgently needed to bring more people and more countries into the process of globalization and growth. Landlocked countries face several logistical challenges. No countries in the Middle East are landlocked and the Middle East countries may act as an "agent" for landlocked regions/countries by improving their transit operations. Traffic demand continues to grow and rail is recognized as safe and environmentally-friendly.

The drivers discussed in this report are mostly external factors which the railways themselves have less influence on than their own internal procedures, market orientation and commercialization.

As we have seen from empiric data, the Middle East, it is not a static causal connection between economic growth/population growth and railway transport. However, some connections are found even though external challenges and lack of stable business/development climate has caused less clear connections between railway transports and economic/population growth. The level and share of railway transports do also depend on the railways' capabilities to capture growth opportunities. There is a huge variation among countries in Middle East and several variables have impact on the outcome.

However, there are common trends which will have impact on railway transports. Even though methods and conclusions may be discussed, it seems to be possible to summarize as follows:

Trade and economy

- o Globalization is largely irreversible. The development in Middle East is also influenced by the development in other regions of the world. For most nations, globalization and trade liberalization are on the agenda, - and as a consequence international transport is growing. The economies of the world will be substantially larger in 2025 and a strong western economy will usually benefit the export-oriented Middle East countries, while a weak economy may have the opposite impact. Western economies, like Europe, may develop to be a more important trade partner of the Middle East and influence the Middle East's trade and transportation in the future. However, strong influence from Asia will most probably continue.
- o Middle East is a region in the global logistical chain. Middle East can improve their international logistical relations and generate significant spin-offs for the regions internal development. Strong initiatives are already found in countries like Iran and Turkey.
- o Internationally, there is a potential for railway transports among Middle East countries and the railways as inland connector for intermodale trade between for instance Middle East and Europe. These trade routes are not only hampered by various administrative/operational challenges, but also logistically through missing links.
- o The Middle East economy (GDP) is generally projected to increase and there may in the future be a stronger correlation between freight transport by rail and GDP together with improved business climate and infrastructure investments. The countries of the Middle East have positive prospects and some are believed to improve significantly by 2025. For some of these countries, improvements are strongly connected to the market price of energy. For the railways, as an important element of national and international economies, it is important to support the economic growth agenda and general industry expansions.
- o The Middle East trades, as well as many railway links, are imbalanced. Imbalance is not only a challenge; - it is an obstacle when developing international competitive transport solutions. Balance can be improved by market- and corridor development, but is depending on a viable supply side accepted by the market.
- o The intra-Middle East trade has historically been low, however slightly improving. Depending on e.g. infrastructure investments and operational development, Middle East's intraregional trade may grow and "internal" transportation needs will most probably be substantially larger in 2025 than 2007. This intra-regional growth may contribute to a certain business diversification and perhaps a more stable climate for the development of the continents railway system. Economic integration in Middle East will also benefit the regions railway transportation due to for instance more homogenous border crossing procedures and more committed cooperation.

Energy

- o The cost of energy has strong influence, directly and indirectly, on railway transportation, -even though the railways energy consumption is low (environmentally friendly mode of transport). Unstable supply and strong growth in demand for crude oil will influence many of the energy-producing economies of the Middle East. A lasting high oil-price will influence the GDP projections, and most probably contribute to continued growth in GDP for many oil-producing economies.

- o The global energy situation has a major impact on Middle East. Transportation energy demand is projected to increase. This is usually a spin-off from the projected GDP increase (or vice versa); but it is a signal that analysts believe that transports will experience strong global growth. Freight transportation by rail is no exception.

Population

- o Population and GDP are expected to grow in the Middle East countries and a quite substantial change is expected by 2025, if the projections are correct. Among the 8 railway countries of the Middle East, there may be 80 million more people who require transportation in 2025 and close to 150 millions by 2050. Most of the growth will take place in large cities in an already urbanized region of the world. The potential demand for passenger transport by rail will be considerable higher in general, and the transportation needs in certain large cities will face more serious challenges.
- o Countries which are facing capacity challenges today will face even more capacity challenges in the future, especially if people's ability to buy transports services increase and the political and administrative environment improve. Further urbanization is expected and some cities may have serious challenges in coping with this centralized demand for transportation services. The surface railways/light railways may, for many cities, be a most relevant option.

Environment

- o Environmental concerns are on the global agenda. Several environmental challenges can generally be reduced by a stronger focus on the railways. Rapid urbanization may seriously strain the existing transport systems and contribute to air pollution and global greenhouse gas emissions. Railway systems are known to be among the most cost-effective, energy- and space-efficient, and environmentally-friendly forms of urban transport. Building such systems is perhaps the best way for the Middle East's large cities to serve their burgeoning populations in a sustainable, equitable manner.
- o Environmental conditions will influence future transports and shift among modes. The railways' own strategy, as well as political priorities, may have positive impact on the future development.

Security and transparency

- o The market player's perception of security and transparency is fundamental for the development of many services in the Middle East. Best practice (and even better than that) security standards are fundamental issues when the future potential until 2025 is to materialize. Strong focus on security and transparency may improve the future outcome.
- o Terrorism risk, as well as political and economical risk, exist several places in the Middle East. When developing international transport corridors through countries where the external market evaluate the risk as "high", -the risk issue should be a central part of the project planning.

Intermodality, logistical chains and interoperability

- o There has to be developed effective port/rail corridors which are attractive for the freight flows. They should not be fragmented and the customer's perception should be a seamless chain.
- o Modal and geographical cooperation, when developing effective intermodale chains are required. A logistical chain is not stronger than its weakest link.
- o Compared with other regions of the world, gauge is not a main challenge for the internal systems in the Middle East. However, neighbouring countries have different gauges and there should be a strong focus on interoperability.

Passenger & freight transports

- o The Middle East has a potential for increased passenger and freight transports.
- o The future depends on several conditions. The railways themselves can only influence some of these conditions
- o By assuming a connection between passenger transports and projected population growth, we can expect a 35% increase in passenger kilometers by rail, from 2006 to 2025. The projected increase in GDP is stronger than the population growth (as an average for the Middle East). If the increase in passenger transports by rail corresponds to the projected increase in GDP, the passenger kilometers in 2025 will be more than twice the 2006 level.

- o The Middle East is improving and we may assume a stronger relationship between GDP and freight transports in the future. Based on this assumption, the Middle east ton kilometers by rail may more than double by 2025 (+115%).

Investments

- o Compared with many regions of the world, the Middle East's track density is low (per capita and per square-km of land area). Investments are required. Several Middle East railways suffer from historical underinvestments in track and asset replacement and renewal and maintenance. Furthermore, in some countries assets are deteriorated by war and conflicts. For many countries the required investments are far beyond their financial capabilities and the business climate is not satisfactory for attracting private capital. Stronger international focus on the Middle East may contribute to additional funding opportunities.
- o Investments are required for existing infrastructure and operational systems, as well as for new infrastructure when improving regional interconnectivity.
- o If the railway network is to be developed according to projected economic growth, close to 30.000 km has to be constructed within 2025. The 2025 network should be 2-2.5 times the 2006 level.
- o Bringing the Middle East average track density up to the EU average requires new investments of 90.000 kilometers of tracks, which gives a total network of 5 times the present level.
- o Investments in one country is also a benefit for other countries when it comes to international transportation

Supply side and final outcome

- o The railways' supply side and operational efficiency are influenced by various drivers and these drivers may have different influence on railway transport. The railways' competitiveness is the total of several variables, including political frameworks, information systems, human capital/skills, logistical systems, market orientation, security and infrastructure investments/material and liberalization. The Middle East railways (countries and regions) are not homogenous. The countries/regions have to focus on the challenges which are most important in each region when developing their internal systems. Furthermore one must look into national discontinuity when developing international logistical supply chains. Such chains can only be developed by national improvements together with international cooperation.
- o The final outcome of future projections will be strongly influenced by how the railways are able to improve their competitive advantages, compared with other modes of transport. Development of products generally accepted by the market players is of fundamental importance. Growth perspectives may not be capitalized by the railways if the capacity¹ limits the growth, or the supply side (the railway product) is not considered competitive compared with other modes. Furthermore, competitors in the market will continue to develop their products and the railways have to improve their performance continuously.
- o Cooperation among the Middle East railways is required. Success depends on collective contribution of all Middle East railways and integrated and coordinated development.

The way forward

The Vision document is a start-up document for UIC's work in the Middle East. It is still work to do and several issues have to be looked closer into. A positive development is possible, and there are successful improvements in many countries and regions.

UIC's focus is the entire Middle East and the Middle East railways. UIC intends to participate on the country level, regional level and on the master plan level.

Even though future is insecure, it is our vision that the demand for transports in the Middle East will grow and that a larger market share will be captured by environmental friendly railways, when railways supply side (railway service) and operational conditions improve. To some extent, and for some countries, the growth can be considerable, - both for passenger- and freight transport.

¹ Capacity is the outcome of several variables, not only investments.

UIC, and UIC's regional unit in the Middle East, intends to be important contributors to the development of railways in the Middle East.

The recommendation for UIC's next step is to put effort in the development of a more detailed action plan for the Middle East railways, based on a common vision. Main development areas should be identified. The work should emphasize the process where members are involved as well as other organizations.

Development of the Middle East railways depends on the demand for railway transports, the entire railway service (supply side), external conditions and the work of organizations like UIC.

Identifying demand

The potential future demand for railway transports on specific Middle East routes should be identified more clearly, as market demand is the basic condition for investments and development of the railway services. This could be done through for instance specific origin-destination (O/D) analysis.

Developing the railways supply side (railway service)

A strategic description of the Middle East railways supply side (including various products and corridors), -based on accepted commercial and logistical criteria's, and focusing on segments where the railways is believed to have strong competitive advantages.

The supply side can (but not always) be influenced by the railways themselves and this work should be emphasized by UIC Middle East. Such factors, which strongly influence the supply side, are for instance:

- o The Logistical operation including equipment and procedures
- o Logistical chains and intermodality/interoperability like effective port/terminal operation
- o Modal and logistical cooperation, like cooperation with ports, shipping lines etc
- o The financial operation and management control systems
- o Development of human resources, organizational development and training of personnel
- o Security standards
- o Customer support and information systems (marketing, tracing etc)
- o Etc

Corridor development

There should be a strong focus on corridor development, including port-hinterland corridors, transit corridors and the connections/synergies between such corridors. The Middle East region has several potential corridor projects; like **the North-South Corridor, East-West** connections through Marmaray, various intermodale connection as well as potential international railways routes. Corridor development requires strong regional/international cooperation, effective Hub- and terminal structures etc.

Influencing policy makers

The Middle East has no general and accepted transport policy for the railways. Several external organizations and policy makers influences the conditions for railways transport. Such conditions may include issues where the railways and UIC have little or no influence on (like interest rates, population growth etc), but also conditions where it is possible to influence policy makers like international organizations and national governments. For example:

- o Preparing for professional inputs regarding the **investments** (infrastructure as well as maintenance) required by the Middle East railways
- o Preparing professional analysis regarding **potential corridors** (including transit corridors), how to improve interoperability and transparency, and showing the benefits of developing railway links and corridors
- o Preparing analysis and information concerning the railways contribution to sustainable development of the Middle East transportation sector

- o Proposing plans for closer cooperation and integration among the railways (which may require assistance from more than one government).
- o Etc

A strong political will is required to develop the railways of the Middle East and their connections. UIC intends to participate in the work, - on the international, national-, and at the corridor level.

Developing the organizational matters for UIC Middle East

Most of the railway nations of Middle East are active members of UIC Capitalizing the growth prospects in these UIC countries are not only depending on well-functioning port connections, but also well-functioning inland connections and corridors. Through the new UIC, these countries should be encouraged to work through UIC and the development of strategic action plans for the region.

Important issues are related to the development of organizational matters for UIC's the regional unit of the Middle East as well as a plan for implementation and how to secure continuity.

The recommendation for UIC's next step next is to develop a strategic plan/action plan for the Middle East railways based on principle discussions in UIC and among the respective members. The work should emphasize the process where members are involved. During the process, where some tasks may take several years, at least the following goals may be obtained for the Middle East Railways:

- An acceptance of a common visions and goals
- Identifying some main common development areas
- Specific strategies related to the huge investments required by the Middle East railways, as well as plans for closer cooperation, integration and how to influence policy makers.
- A strategic description of the Middle East railways' supply side (various products and corridors), -based on commercial criteria and their competitive advantages.
- Development of a membership strategy, organizational matters and a plan for implementation and how to secure continuity

4 Background and objectives

The preparation of the UIC strategy for the Middle East railways should be linked to a common vision for these railways. This is not a simple task, due to various and heterogeneous conditions among these countries and railways.

A vision document is not a plan. It is background document for future strategies and work. The document will include a brief overview of the Middle East railways, major conditions which is believed to have impact on railway development and prospects for the future.

Furthermore, an ambition is to generate additional and updated information which is relevant for UIC's strategy for the development of the Middle East railways.

There is a strong focus on economic growth perspectives, development within the energy sector, population growth, urbanization as well as environmental issues.

However, the future strategies for UIC and the Middle East railways should be identified, be clearly stated and contribute to UIC's various sub-strategies for Middle East. Further development has to be done by UIC-Middle East, together with the UIC HQ in Paris.

All relevant Middle East railways/countries are included. However, some countries do not have easy accessible information and the reliability of the information can be questioned.

For the purpose of this report, Middle East is defined as 14² countries, whereof 8 have railway infrastructure.

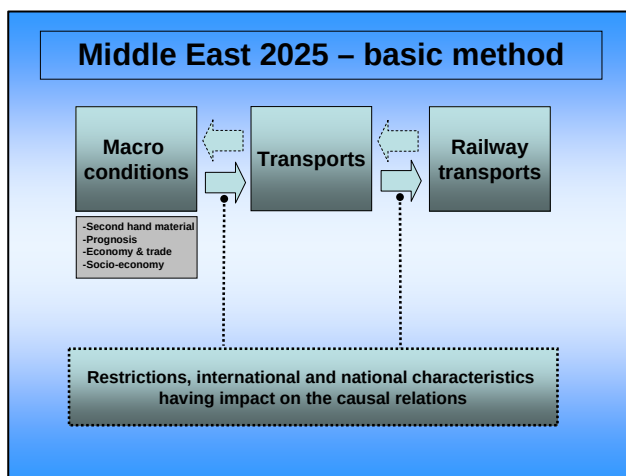
5 Methods and hypothesis

The relationships between transportation and the economic/socio-economic conditions are very complex and poorly understood. Some of these relationships are also clearly circular. Transportation is a massive enterprise with substantial direct and indirect effects on economic productivity and economic growth. Transportation industries, the provision of transportation services, the manufacture of vehicles, and the construction of infrastructure, are major economic activities in themselves.

Transportation is a cost, to a greater or lesser extent, of virtually any commercial activity. Transportation is also an enabler of economic activity and a facilitator of international trade.

Transportation is a measure of economic activity and it may often be a leading indicator.

Figure 5-1: Relation between transport and macro-conditions



The method is based on the development of a simplified model where the basic input is second hand macro data produced by global organizations like United Nations, World Bank, IMF, WTO etc. Macro

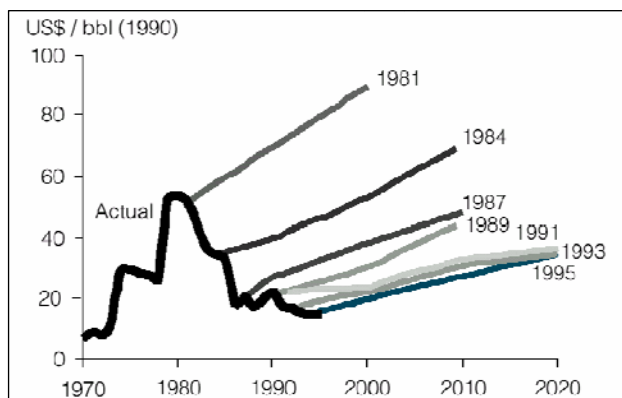
² See enclosure I

data like population- and GDP growth are considered most important. The perspective in time is 2025.

The output from the model indicates the basic impact that these macro variables might have on railway transport; -passenger transport and freight transport. Furthermore the projections will be refined and restrictions established. These restrictions are established based on general theory, as well as first hand information collected from market players and governmental institutions. The output intends to indicate prospects for railway transport in Middle East as well as strategic decisions.

It is not an objective, and it is not possible, to produce exact data for the future. The ambitions are to generate some information and initial guide lines for UIC's further work in Middle East, together with its members and cooperation partners, by looking into a few macro variables and empirical information.

The purpose is not necessarily to pinpoint the most likely future actions, but to highlight the forces that push the future in different directions. Millions of probability prognosis has been made through history without success. Even though historical data can give us an indication of the future, unforeseen incidents often arise.



Previous **oil price predictions** are an example. When the price hike reached 60 US \$ /bbl in the late seventies, many predicted this trend to continue into the next decade (see figure left). The actual progress after 1980 turned out to be a significant decrease and the prognosis failed. This illustrates the difficulties in making prognosis when several multi-variables are included, such as the oil price.

Figure 5-2: Projection for the future - difficulties

This paper aims to look into different drivers³ influencing the future of railway traffic in Middle East towards 2025. These drivers are uncertain and complex.

The list of drivers will never be complete and analysts will have different views. For the purpose of looking into the railways future, freight and passengers, the main focus have been put on variables which is possible to identify, quantity and rank, -like GDP, energy, population etc. Drivers which are discussed are:

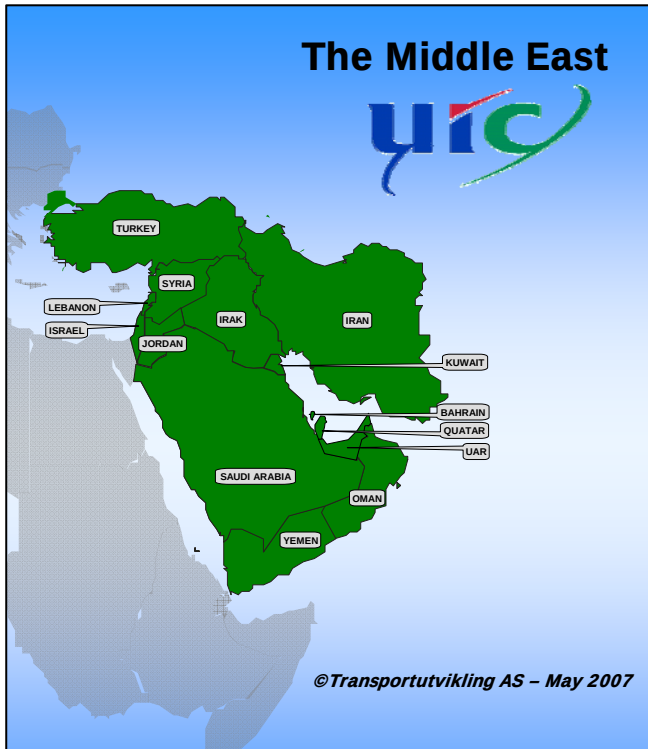
- **Transportation issues**
 - o competition, technology, infrastructure and operational conditions
- **Demographical and environmental issues**
 - o population, urbanization and environmental development
- **Energy and economy**
 - o oil prices, energy, GDP, international trade and economic structure
- Other conditions – restrictions
 - o political conditions and security

³ The drivers are those variables which have an effect on how the future will unfold in a particular area. In other words, -variables that will have impact on the future of the Middle East Railway.

6 The world and the Middle East market

6.1 The Middle East

The Middle East is a historical and political region of Africa-Eurasia with no clear definition. The term "Middle East" was popularized around 1900 by the British, and has been criticized for its loose definition. The Middle East traditionally includes countries or regions in Southwest Asia and parts of North Africa. For the purpose of this UIC-report, the Middle East does not include African countries. However, Turkey is included in our definition, which makes a total of 14 countries.



Middle East (as defined in this report) covers 1,2 % of the Earth's total surface area, and 4,1 % of the total land area.

Middle East defines a geographical area, but does not (as mentioned) have precise defined borders. The region is connected to the land areas of Africa, Asia and Europe. The Middle East is also connected to maritime areas where the major trade Lanes between Asia and Europe operates, to the Caspian Sea and to the Black Sea. The proximity of the Middle East region to other fast growing regions e.g. South Asia, East Africa and CIS is also a benefit when it comes to increased trade and transportation.

Figure 6-1: The Middle East

The Middle East primarily consists of arid and semi-arid land areas, with grasslands, rangelands and deserts. Water shortages are a problem in many parts of the Middle East, with rapidly growing populations and increasing demands for water and with salinization and pollution threatening water supplies. Major rivers, such as Tigris rising in Turkey, having many branches and crossing the territory of Iraq and joining with the Euphrates and flowing into the Persian Gulf provides sources for irrigation water to support agriculture.

The Middle East lies at the juncture of Eurasia, the Mediterranean Sea and the Indian Ocean. Several countries are geographically close to several neighbors, and a country like Iran has land- and sea borders with fifteen different countries.

The Middle East is the birthplace and spiritual center of the Orthodox Christianity, Islam, Judaism, Yezidi, and, in Iran, Mithraism, Zoroastrianism, Manichaeism, and the Bahá'í Faith. Throughout its history the Middle East has been a major center of world affairs; a strategically, economically, politically, culturally and religiously sensitive area.

The modern Middle East was formed after World War I, when the Ottoman Empire, which was allied with the defeated Central Powers, was partitioned into a number of separate nations. Other defining events in this transformation included the establishment of Israel in 1948 and the departure of European powers, notably Britain and France. They were supplanted, to an extent, by the rising influence of the United States.

In the 20th century, the region's significant stocks of crude oil gave it new strategic and economic importance. Mass production of oil began around 1945, as Saudi Arabia, Iran, Kuwait, Iraq, and the United Arab Emirates having large quantities of oil. Estimated oil reserves, especially in Saudi Arabia and Iran, are some of the highest in the world, and the international oil cartel OPEC is dominated by Middle Eastern countries.

During the Cold War, the Middle East was a theater of ideological struggle between the two superpowers: the United States and the Soviet Union, as they competed in influencing regional allies. Within this contextual framework, the United States sought to divert the Arab world from Soviet influence. Throughout the 20th and into the 21st century, the region has experienced both periods of relative peace and tolerance and periods of conflict and war. Current issues include the Iraq War, the Israeli-Palestinian conflict and other issues on the political agenda.

The Middle East has a rapidly growing population of approximately 250,000,000 people (as of 2006) living in 14 countries (4% of the world's human population). Only one country is defined as an island (Bahrain) and none are landlocked.

6.2 The market

The global trade is growing and particularly container transports. The fastest growing markets are in Asia, - intra Asia as well as Asia's international relations. Europe, Asia and North America are the dominating trade regions of the world.

The Middle East counts for a small share of the **world's merchandise trade (4.3% in 2006)** while Europe alone counts for 43% of the world trade. The trade volume in Europe is 10 times the Middle East trade volume while the European population is 3 times the Middle East population. Figure 6-2 shows world merchandise export and imports in 2006, measured in billion USD. The Middle East⁴ counts for 5.5% of the world merchandise exports and 3.1% of the imports.

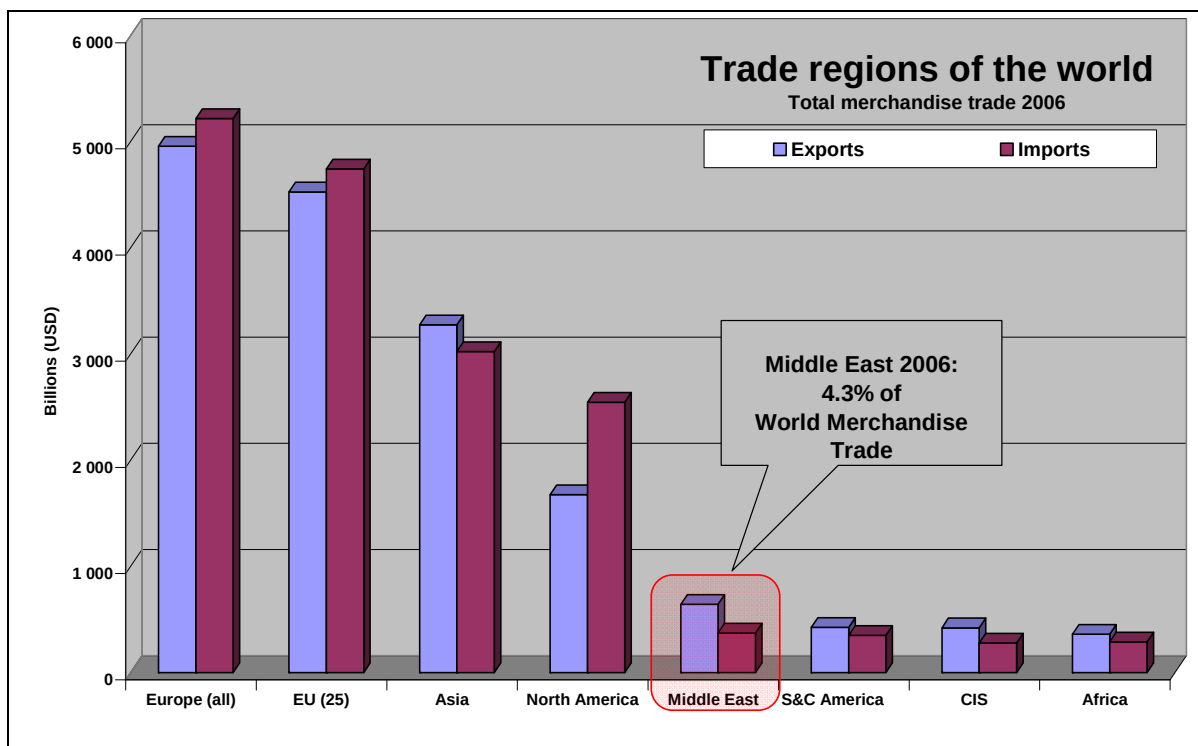


Figure 6-2: Trade regions of the world, 2006

⁴ Based on WTO statistics, not including Turkey

The merchandise trade of Middle East has been growing above world average, particularly exports. The Middle East has achieved quite high growth in merchandise trade during the last years and in 2005 the export growth were 21.4% above world average, while import growth were 4% above world average. Figure 6-3 shows the Middle East merchandise trade (exports and imports) from 1995 to 2006. The growth started to accelerate in 2003 and this situation has continued.

From 1995 to 2006, the exports increased 3,3 times and imports 1,8 times. The main share of this growth is more perceptible after 2002.

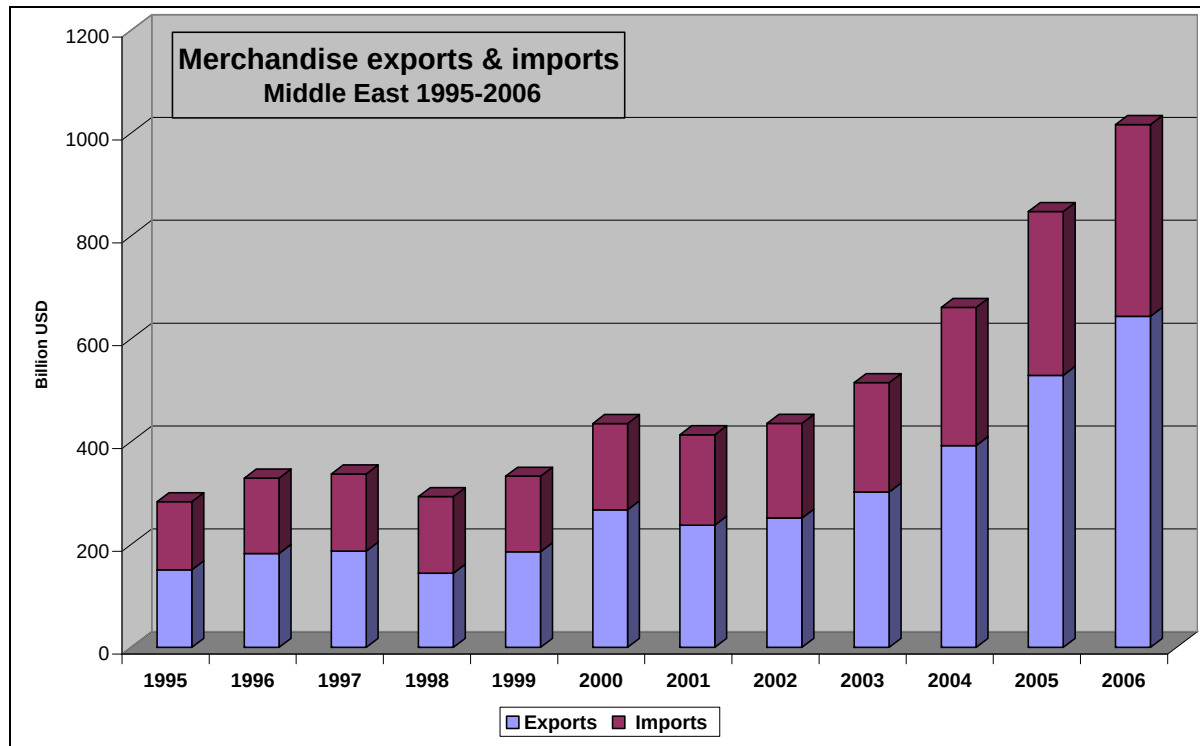


Figure 6-3: Middle East exports and imports 1995-2006

Source: WTO, March 2007

The figure above does not include Turkey. Turkey alone counts for approximately 11% (2005) of the Middle East Trade (according to the UIC definition of Middle East). In 2005 the Turkish merchandise trade amounted to 94 billion USD. The Turkish trade is more balanced compared with the average of the other Middle East countries, where merchandise exports is dominating the trade (oil products).

As a result of the globalization, world trade volume has continued to grow with the gradual removal of trade barriers under the World Trade Organization (WTO) and through regional trade agreements (RTA).

Globalization creates new and longer transportation routes. Middle East is located along the main trade lanes between Asia, Africa, Europe and the North American East Coast. Asia is, by most projections, put in the center of the future development, -particularly when it comes to production of processed goods and parts. The figure below (Figure 6-4) is an indication of routes which are, and may further develop into, major trade and transportation lanes in the future.

The main reason for the development in Asia is related to low production costs and many developing Asian Countries having adapted to market requirements, liberalized trade barriers and created political and administrative conditions which are favorable for foreign investments and trade. By improved logistical solutions and business climate, it is also possible to look at the Middle East as a global transit area, not only a main exporter of oil products. A country like Iran has a strong focus on

their role in international transit and they are progressively improving their transport solutions and promoting their favorable geographical location.

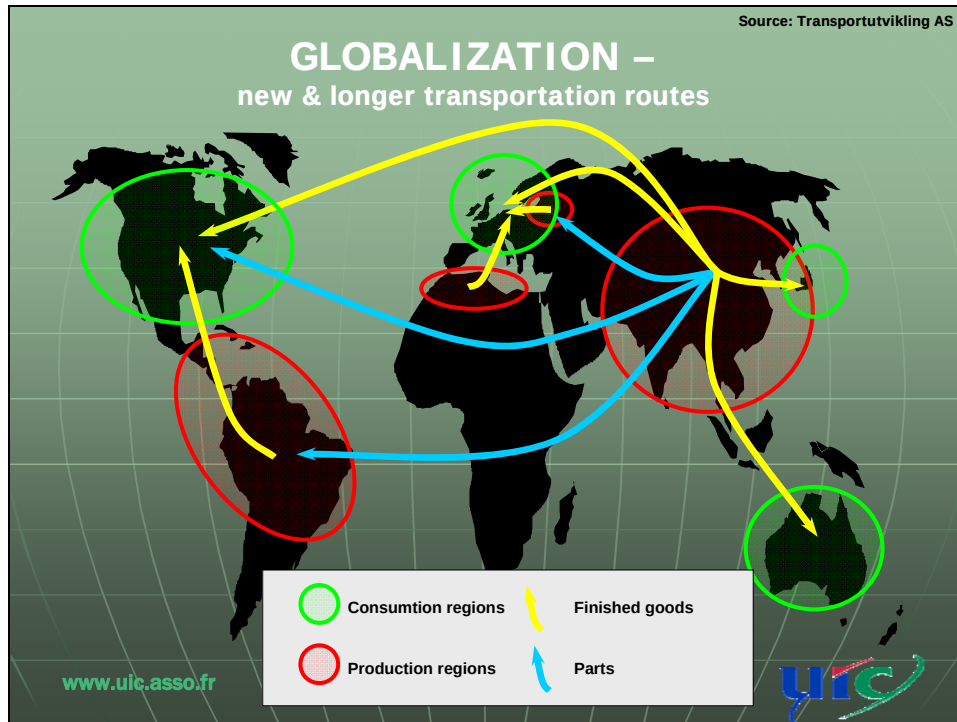


Figure 6-4: Globalization, new and longer transportation routes

While the rate of world economic growth fluctuated greatly during the post-world war II period, the relationship between economic growth and growth in the value of international trade remained almost constant until 1980s: the value of trade grew approximately 1.5 times as fast as the world economy. However, the 1990s and early 2000s have seen a major change in this ratio: the value of trade is now growing at around 2.5 times the rate of growth of the world economy. As this pattern continues, trade and transportation may be an ever more crucial component of Middle East's economic activity and development (see chapter 7.4).

Even though Middle East's projected economic growth are slightly lower (See chapter 7.4.1.2) than the most expansive regions of the world (Asia, CIS etc), the projected growth, transformed into transportation at a pace on 2-2.5 times, will have a tremendous impact on the entire transportation system in Middle East.

When looking at container transport the world experienced during the 1990s and in early 2000s that the world container trade accelerated to an average growth rate of more than 9% per year. This can be attributed to several reasons:

Ocean transport is dominating the transports between Middle East and the rest of the world. Due to geographical conditions, and commodity base, ocean transport will continue to dominate the transportation between Middle East and Europe/North America/Asia. However, the possible future development towards Europe and inlands destinations in Asia is a most relevant opportunity for the Middle East Railways and container transports. This intermodal unit (the container) is perfectly fit for railway transport and for logistical chains challenges by transloading operations (like gauge break).

7 Conditions having impact on railway transport

This chapter will further describe important drivers⁵ behind the development of the Middle East railways as well as economic conditions utilized in the basic estimates for further development. The impact on railway transport towards 2025 by the various drivers is not easy to estimate and the uncertainty is underlined.

Economic development and population increase are important factors when determining future transportation requirements as well as other variables influencing transport, like energy and other resources necessary for industrial production and people's buying power. According to various observations and analyzes, GDP per capita may be a relevant indicator for describing the state of economic development of a country, however not necessarily the most valid indicator when it comes to international freight transports.

7.1 Demographical issues

Population, urbanization and geographical and environmental issues have impact on transport in general and passenger transport in particular. The Middle East's cultural diversity and geographical conditions contribute to the complexity. A broad, and complex, set of social, demographical and environmental factors influence future rail traffic.

7.1.1 Population growth

The definition of Middle East in this document is 14 countries whereof 8 have operational railways. In the table below we have also included the Gaza Strip (The Gaza Strip has an unusable railway running from north to south).

World Rank	Country	Population (est. July 2006)	Share of Middle East	Acc share	Rail- ways?
19	Turkey	70 413 958	27,0 %	27,0 %	x
20	Iran	68 688 433	26,3 %	53,3 %	x
45	Saudi Arabia	27 019 731	10,4 %	63,7 %	x
46	Iraq	26 783 383	10,3 %	73,9 %	x
53	Yemen	21 456 188	8,2 %	82,2 %	
57	Syria	18 881 361	7,2 %	89,4 %	x
104	Israel	6 352 117	2,4 %	91,8 %	x
106	Jordan	5 906 760	2,3 %	94,1 %	x
128	Lebanon	3 874 050	1,5 %	95,6 %	x
135	Oman	3 102 229	1,2 %	96,8 %	
140	UAE	2 602 713	1,0 %	97,8 %	
142	Kuwait	2 418 393	0,9 %	98,7 %	
152	Gaza Strip	1 428 757	0,5 %	99,2 %	-
160	Qatar	885 359	0,3 %	99,6 %	
163	Bahrain	698 585	0,3 %	99,9 %	
174	Brunei	379 444	0,1 %	100,0 %	
	TOTAL	260 891 461	100,0 %		

Table 7-1: Middle East population, 2006

Table 7-1 shows the population of 14 (15) countries/provinces located in the Middle East (Source: World Fact book, 2006). As per July 2006 approximately 3,6% of the world population is estimated to be living in Middle East and more than 80% of the of the Middle East's population is located in the 5 most populated countries. Countries like Turkey and Iran count for more than 50% of the Middle East's population.

⁵ The drivers are those variables which may have an impact on the future of the Middle East Railways.

The Middle East's population has been growing almost at the world growth rate between 1995 and 2005. The Middle East population has increased by 20% and world average growth, for the same period, is 22%). The growth is expected to continue above world average (UN).

Predictions from United Nations Population Division (2006) indicate a 38% (Medium scenario) increase in the population of Middle East from 2005 to 2025. For the same period, Asia is expected to grow by 21% and Africa by 48%.

From 2005 to 2050 the increase is expected to be 74% (Medium Scenario). Asia is projected to grow by 34% and Africa by 114%, for the same period.

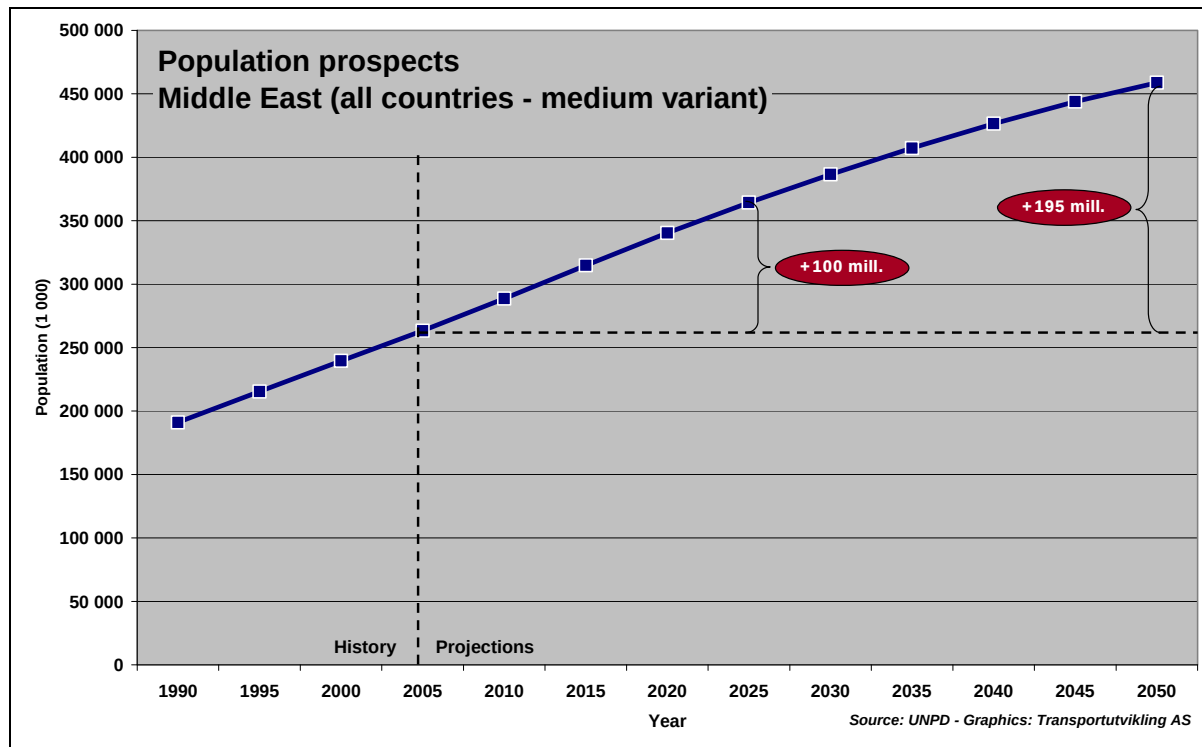


Figure 7-1: Population prospects 2050
Source: UN Population Division, April 2007

Figure 7-1 shows the Medium Scenario used by the UN Population Division (figures in 1 000). The total Middle East population in 2005 was more than 260 millions. Compared with 2005, the 2025 population is expected to increase by approximately 101 millions and by 2050 by 195 millions.

The total population in Middle East is expected to be approximately 365 millions by 2025.

The significant increase is applicable for almost all Middle East nations. However, this aggregate figure does not show that there are major differences in growth rates between the countries.

These variations are shown in table 7-2 Table 7-2: UN Population growth scenario for the Middle East (countries ranked by growth rate 2005-2025). Yemen is growing by 77% from 2005 to 2025, while a country like Turkey shows 24% for the same period. More than 80% of the population is located in 5 countries (Yemen, Iraq, Saudi Arabia, Iran and Turkey). For the period 2005-2025, 80% of the Middle East population growth is expected to originate in these countries and 80% of the population will still be living in the same countries.

In Middle East, no countries are expected to show a reduction in population.

The railways of the Middle East – Vision 2025

Country	2010	2015	2020	2025	2030	2035	2040	2045	2050	2005-2025	2005-2050
Bahrain	791	852	910	965	1 016	1 062	1 100	1 130	1 155	33 %	59 %
Iran	74 283	79 917	85 036	89 042	92 253	95 204	98 023	100 403	101 944	28 %	47 %
Iraq	32 534	36 473	40 522	44 664	48 797	52 833	56 694	60 328	63 693	55 %	121 %
Israel	7 315	7 838	8 296	8 734	9 156	9 545	9 884	10 167	10 403	30 %	55 %
Jordan	6 338	6 956	7 556	8 134	8 672	9 149	9 556	9 917	10 225	43 %	79 %
Kuwait	3 047	3 381	3 698	4 002	4 296	4 577	4 840	5 076	5 279	49 %	96 %
Lebanon	3 773	3 965	4 140	4 297	4 428	4 531	4 611	4 669	4 702	20 %	31 %
Oman	2 863	3 173	3 481	3 776	4 053	4 313	4 554	4 771	4 958	47 %	93 %
Qatar	894	972	1 036	1 098	1 158	1 214	1 263	1 302	1 330	35 %	64 %
Saudi Arabia	27 664	30 828	34 024	37 160	40 132	42 865	45 309	47 466	49 464	51 %	101 %
Syria	21 432	23 802	26 029	28 081	29 983	31 724	33 297	34 723	35 935	47 %	89 %
Turkey	78 081	82 640	86 774	90 565	93 876	96 573	98 651	100 189	101 208	24 %	38 %
UAE	5 035	5 588	6 144	6 693	7 225	7 734	8 213	8 657	9 056	49 %	101 %
Yemen	24 502	28 480	32 733	37 094	41 499	45 968	50 508	55 048	59 454	77 %	183 %
Total	288 552	314 865	340 379	364 305	386 544	407 292	426 503	443 846	458 806	38 %	74 %

Table 7-2: UN Population growth scenario for the Middle East

Countries with railways

The major part of the Middle East's population is located in the countries where railways are in operation (8 countries). Close to 88% of the Middle East population is living in "railway countries" (2006). All countries are expected to have an increase in population by 2025 and 2 countries are expected to have a significant growth by more 50% (Iraq and Saudi Arabia).

The expected population increase in the eight "railway countries" is illustrated in the figure below. The total population growth for these countries is 38% between 2005 and 2025 and 63% between 2005 and 2050. By 2025, 80 million new citizens will require transport services, and by 2050 more than 145 millions, compared with 2006.

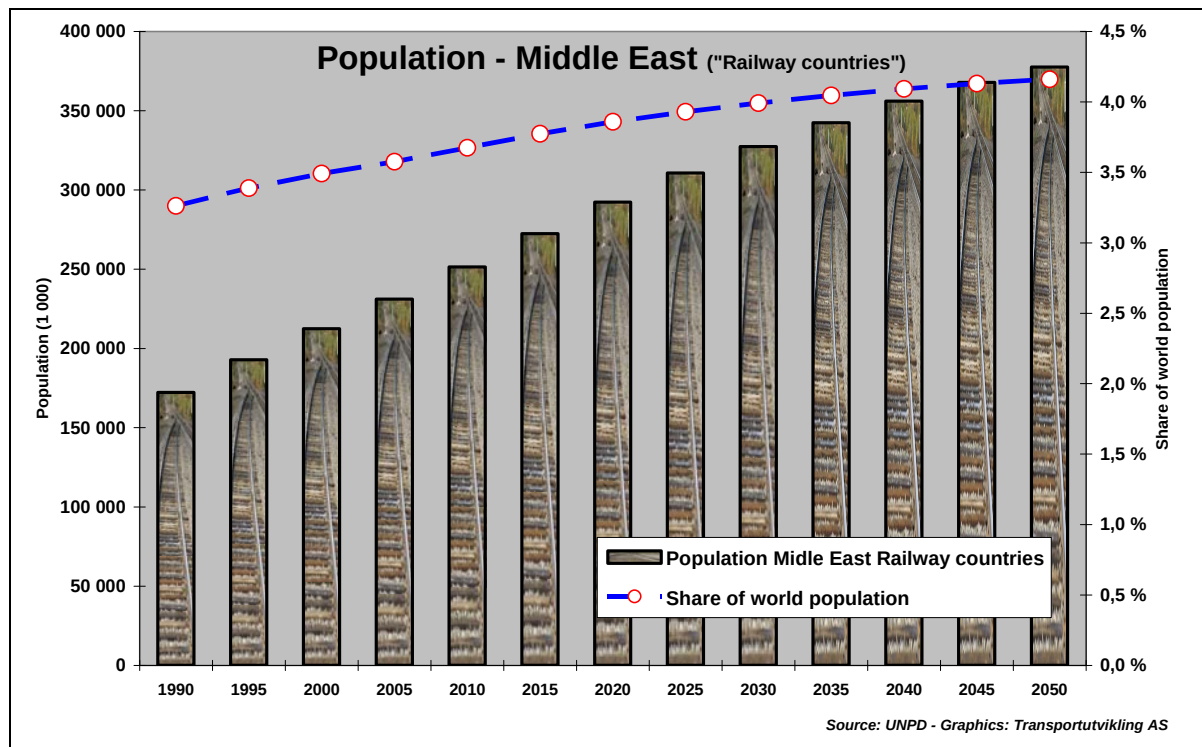


Figure 7-2: Middle East population and share of world population 1990-2050 (railway countries)

The fastest growing railway countries (growing by more than 25% from 2005 to 2025) are representing approximately 160 million people (2006). By 2025 the population in these countries (all except Turkey and Lebanon) are expected to be 216 millions (+40% compared with 2005) and by 2050; 272 millions (+76%).

Historical data from other regions of the world ("The Railways of Asia, visions 2025", UIC 2006) seem to support a correlation between passenger-km by train and population changes. For China and India, which are the most populated countries in the world and where information is quite reliable, the correlation is approximately 0.95 for the period 1980-2004 for both countries. For some Middle East countries, the same relations can be verified.

7.1.2 Urbanization

Figure 7-3 shows the expected urban population (%) in the Middle East countries for the period 1990 to 2030. The urban population is expected to increase in all countries. Together with the expected increase in total population, several implications for transport and railway traffic in particular are expected.

Among the railway countries, the rate of urbanization is growing fastest in Iran, Turkey and Syria, all by approximately 10%. The highest urbanization rate in 2030 is expected to be found in Israel, Saudi Arabia and Lebanon (92-93%).

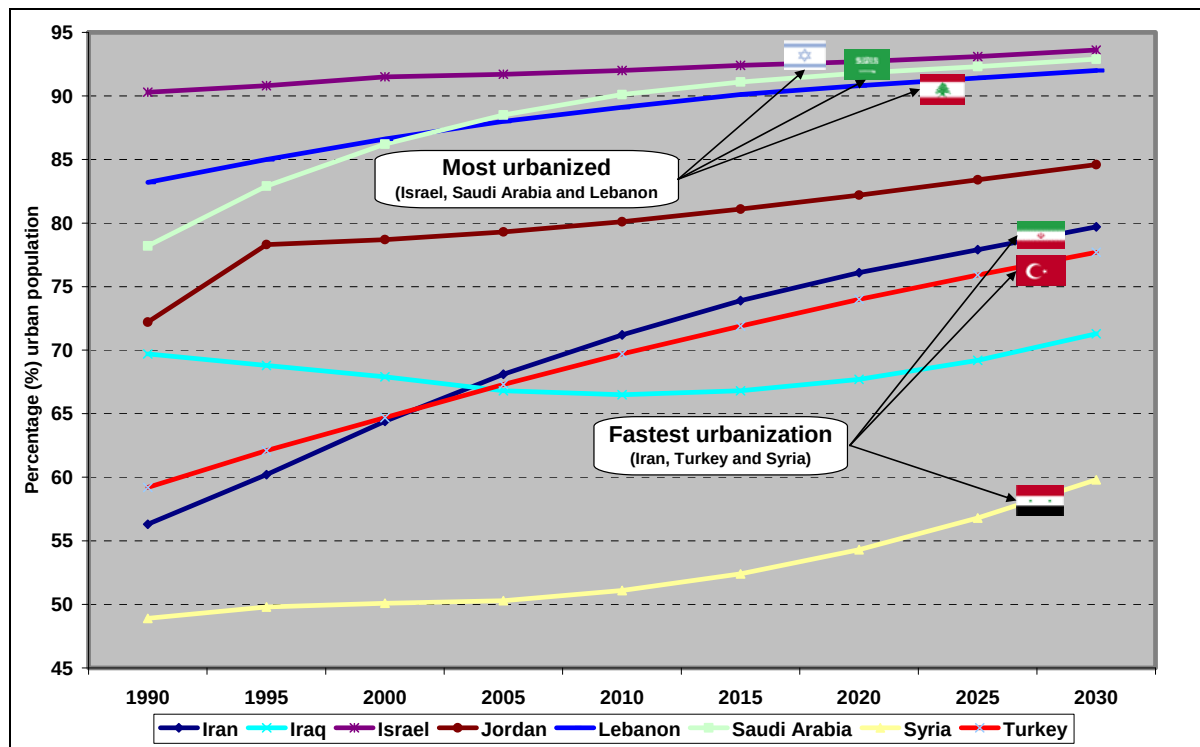


Figure 7-3: Middle East Railway countries, percentage urban population, 1990-2030
(Source: UN Population Division, Grapics vy Transportutvikling AS)

According to United Nations⁶ there were 20 mega-cities⁷ in the world in 2005 (5 in 1980). According to UN, none of these were located in the Middle East region.

In 2007, for the first time, half the world's population lives in cities. In the Middle East, the share of urban population is much higher than the world average and most countries show 70-90% urban population. Only Syria is close to the world average (50% in 2005).

As the major share of the Middle East is, and will be, living in urban areas, enhanced focus is required when it comes to passenger transport in several regions and cities. The main focus

⁶ UNESCAP, Review of developments in transport in Asia and the Pacific, 2005

⁷ A mega-city is defined as being a city with a population of more than 10 million

concerning the population increase and urbanization is thus how to provide satisfactory transportation for people, as well as to cope with growing urban freight transport demands, like transportation of garbage. Governments of many countries have begun studying or implementing projects to develop rail-based mass transit systems in response to the shortcomings of road-based transport systems to meet growing demands in very large cities.

The focus should of course not only be put on the “mega-cities”. The Middle East has several large cities which, to some extent, have the similar challenges as the mega-cities. Table 7-3 shows the 6 largest cities in the Middle East figuring on the top-100 cities of the world (Source: City Mayors, 2007).

Large cities are found in Turkey, Iran, Iraq and Saudi Arabia. They are all expected to grow, -some very fast. A city like Riyadh (Saudi Arabia) is expected to grow by more than 50%, from 5,76 millions in 2006 to 8,82 millions in 2020.

City	Country	Population (mill)		
		2006	2020	Change
Istanbul	Turkey	10,00	12,76	28 %
Tehran	Iran	7,42	8,86	19 %
Baghdad	Iraq	6,06	8,41	39 %
Riyadh	Saudi Arabia	5,76	8,82	53 %
Jedda	Saudi Arabia	3,96	5,94	50 %
Ankara	Turkey	3,69	4,85	31 %

Actual figures today shows that the growth may be even stronger than expected in 2005/6. A city like Istanbul, as per 31.12.2007 has a population of close to 12,6 millions.

Table 7-3: Largest Middle East cities (urban areas)

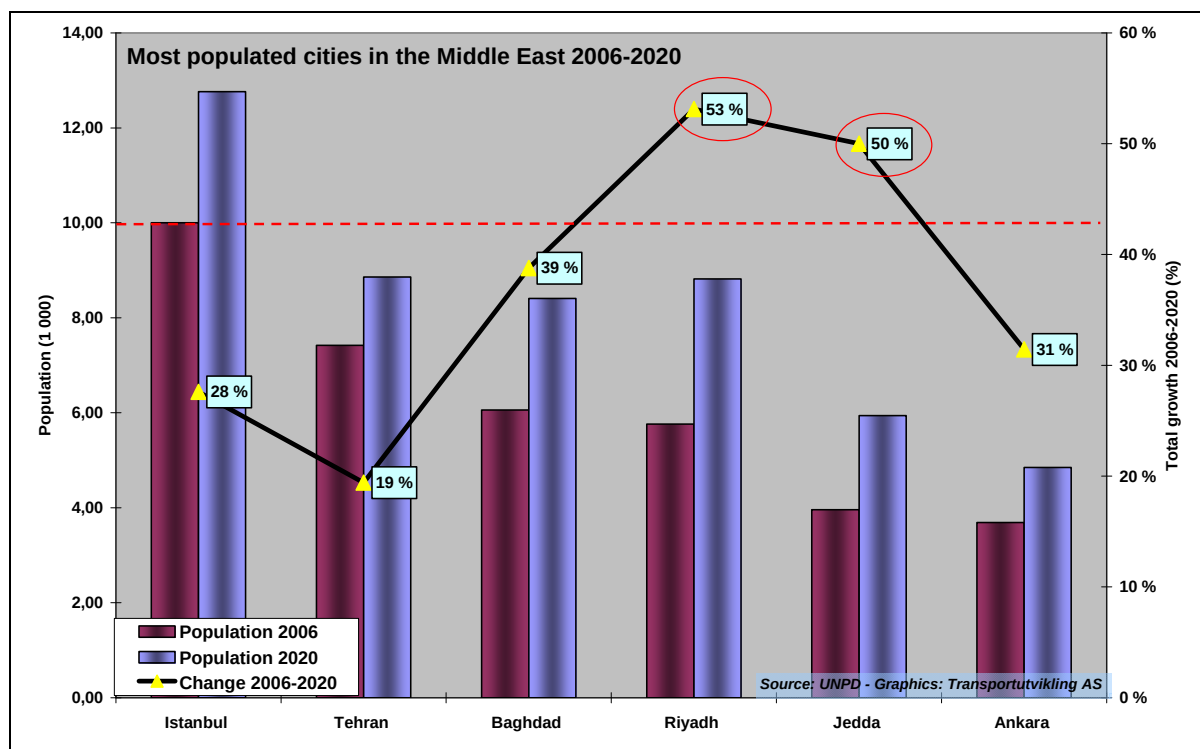


Figure 7-4: Largest cities of the Middle East 2006-2020

In 2020 the Middle East is expected to have 1 mega-city. Istanbul was close already in 2005 and in 2020 the city is expected to have close to 13 million inhabitants.

The Middle East's growing urbanization and indeed also the existing urbanization, will seriously strain existing transport systems and contributing to air pollution and global greenhouse gas emissions. Railway systems are known to be among the most cost-effective, energy- and space-efficient, and environmental friendly forms of urban transport. Building such systems is the most relevant way the

large cities of the Middle East as they can serve their burgeoning populations in a sustainable, equitable manner.

7.2 Environmental development

It's agreed that promotion of the railway transport in any region must meet many goals. Such goals may include healthy living and working environments for the inhabitants, but also a sustainable relationship between the use of the new transport infrastructures and the natural resources and the ecosystem on which they draw.

Mode	Air	Water resources	Land resources	Solid waste	Noise	Accident risk	Other impact.
Rail 			Land taken for rights of way and terminals; dereliction of obsolete facilities.	Abandoned lines, equipment and rolling stock	Noise and vibration around terminals and along lines	Derailment or collision of freight carrying hazardous substances	Partition or destruction of neighbourhoods, farmland and wildlife habitats.
Road 	Local(CO,CH,NO fuel additives such as lead and particulates) Global (CO ₂ ,CFC)	Pollution of surface water and groundwater by surface run-off; modification of water systems by road building.	Land taken for infrastructure: extraction of road building materials	Abandoned spoil tips and rubble from road works; road vehicles withdrawn from service; waste oil.	Noise and vibration from, cars, motorcycles and lorries in cities along main roads.	Deaths, injuries and property damage from accidents; risk from transport of hazardous substances; risk of structural failure in old or worn road facilities	Partition or destruction of neighbourhoods, farmland and wildlife habitats; congestion.

Table 7-4: The main environmental effects of rail and road transport
(Source: Jean Manirakiza, Transportutvikling AS)

It appears from this comparative table on environmental effects that transport in general is an important source of external effects such as air pollution, noise, casualties and congestion. For certain categories such as NO, CH, CO, the contribution of road traffic are dominant and a major source of specific pollutants such as lead.

Considering the significant share of the inadequate transportation system in climate change, the Kyoto protocol (an international and legally binding agreement to reduce greenhouse gas emissions world wide) has recommended integrating transport policies and sustainable mobility into the climate change framework. Regarding the railway transport, it is expressed that the CO₂ advantage of the railways provides the means of achieving the aims of the Kyoto Protocol and making a key contribution to sustainable mobility. The European Environment Agency, for example, is continuously working to improve the rail sector and its environmental performance. Indeed, railways are crucial to reducing greenhouse gas emissions and creating sustainable transport systems. They offer the most energy efficient performance both according to passenger/km and tonne/km. A shift of 3 % from road to rail transport corresponds to 10% decrease in greenhouse gas emissions. There is no doubt that moving from road to rail is a key to achieving the Kyoto Protocol targets and, at the same time, a sustainable global transport policy for the future.

The most important environmental issue of railways is noise. Basically, rolling noise in railways is created by rough wheels and tracks. In the European Union, noise concern has led to the Environmental Noise Directive (END), and railway noise emissions of new and upgraded vehicles have recently been limited by EU legislation. If rough wheels and tracks can be kept smooth, noise can be reduced significantly. Smooth wheels can be achieved by replacing cast-iron brake –blocks with composite brake blocks. Once again, this railway technology, already improved in the European Union makes railways the most sustainable means of transportation.

Those evident advantages of the rail transport should be improved through complex modernisation interactions implemented according to sound environmental principles. This means that the designing of new railway projects, rehabilitation and maintenance operations must be inflicted to a prior environmental impact assessment. This will include the impact of the rail transport on: Human

beings, flora and fauna, soil, water, air, climatic factors, landscape, material assets including architectural, archaeological and cultural heritage.

Let us mention that despite the capital cost of the electrification equipment, electric trains have environmental advantages, including the lack of exhaust fume and less noise. In countries where electricity comes from non-fossil sources, such as Austria and France, electric trains also produce fewer carbon emissions than diesel trains.

To meet those environmental objectives (air and noise pollution, climate change, accidents and congestion) and at the same responding to the current population growth and urban area expansion, a robust rail system is crucial in the Middle East.

As has been recognized for the other regions, railways are an answer to the problem of climate change and offer an efficient transport built on social equity, low environmental impact and positive economic growth, resulting in more sustainable mobility and an improved quality of life.

Railway is considered as an environmentally sound carrier, especially when compared to road. The figure below is a comparison of total external costs (not including congestion) by transport means and cost category. The figure illustrates that railway transport (both passenger and freight) produce significant lower external costs than modes like road and aviation transport. These benefits may further be developed by additional electrification of the railway network. As per 2007, only a small share of the Middle East railway network is electrified.

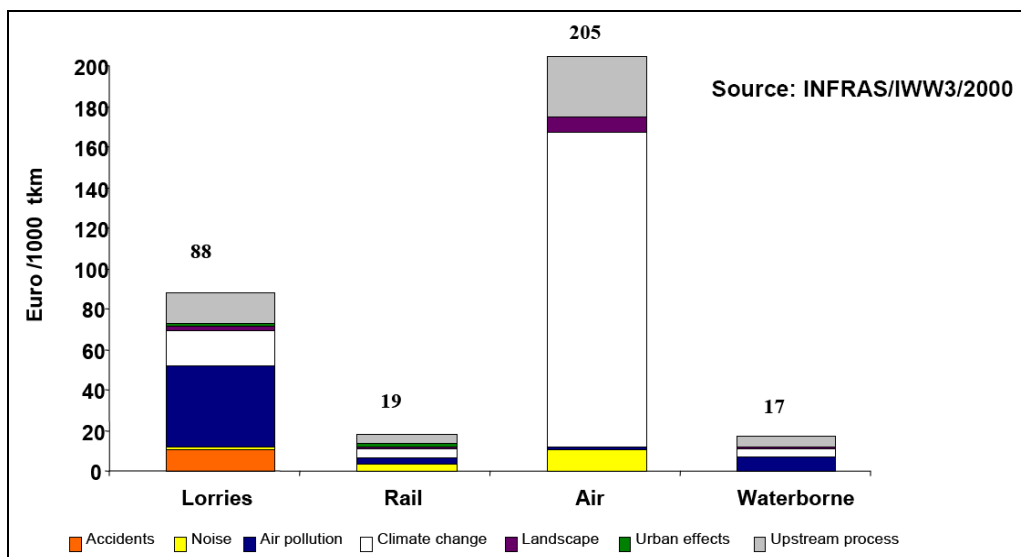


Figure 7-5 External costs, different transport modes

7.3 Energy and energy security

The energy situation (demand, supply, price level, security etc) is considered to have a major impact on economic growth and logistical operations. The transportation sectors energy consumption includes fuels for the purpose of moving people and goods by road, rail, and air. Petroleum products continue to dominate energy use in the transportation sector; barring any widespread increase in the penetration of new technologies and operational behavior. A shipping line like for instance Maersk has reduced their operational vessel speed due to raising oil-prices (*Poul Woodall, Maersk, MEED conference in Dubai, January 2008*). The use of alternative fuels is expected to remain relatively modest through 2030 (EIA, International Energy Outlook 2006). In the context of this study, -energy is mainly related to price and supply of oil, and the availability of electricity as an alternative to oil.

The price of oil has an impact on upon most nations' gross domestic product. For the Middle East, the high oil-price has been a major driver for growth and investments during the last years.

Many oil-analysts project the price of oil to reach USD 100 per barrel on a medium term perspective (2207). However, early 2008 some analysts have reduced their projections by up to \$20 per barrel, showing that projecting the future is complicated. *Figure 7-6* shows two different possible scenarios concerning the price of oil towards 2030. (Source EIA, 2006). The current level is above both these scenarios (USD 70-80 per barrel). EIA projects a 1.4-percent average annual growth rate for transport related petroleum demand from 2003 to 2030. Much of the projected growth in demand for petroleum products in the transportation sector comes from the non-OECD economies (2.3 percent per year) as compared with the OECD countries (0.8 percent per year). Energy demand in the non-OECD transportation sector as a whole is expected to grow at an average annual rate of 2.3 percent until 2030.

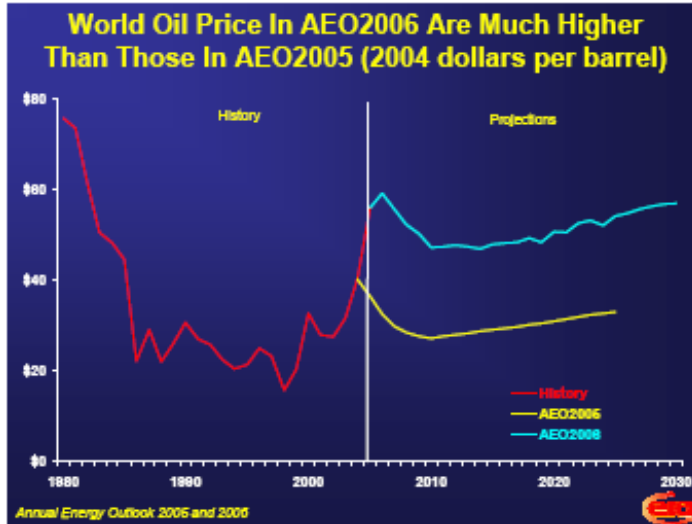
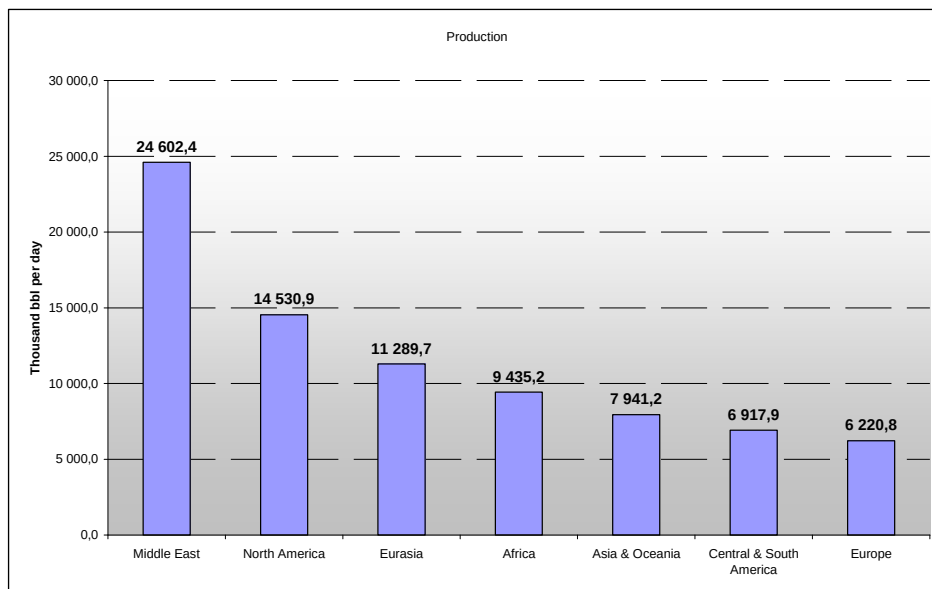


Figure 7-6: World oil price projections

Oil production

Figure 7-7 (Source: EIA 2006, <http://www.eia.doe.gov/emeu/international/oilproduction.html>) shows the world oil production divided between global regions. Middle East is by far the worlds largest oil producing region with 30,4% of the worlds total oil production. The production reached 24,6 million barrels per day⁸ (EIA 2007, International Energy Annual 2004).



North America is the second largest region with a daily oil production of 14,5 million barrels (EIA 2007, International Energy Annual 2004). Europe is the smallest producing region with a daily production of 6,2 million barrels per day.

Figure 7-7: World oil production 2004

Turkey is included in Europe's oil production in this graph. Turkey's oil production was in 2004 ca. 42 thousand barrels per day. The largest oil⁹ producing countries is shown in *table 7-5*. Five out of the top 15 countries are located in the Middle East.

⁸ Production of Crude oil, NGPL and other liquids.

⁹ Source: EIA: International Energy Annual (2000-2004), International Petroleum Monthly (2005-2006)

The production in the Middle East countries is huge and Saudi Arabia as the largest producer has a production of 10,5 million barrels per day in 2004. Israel and Jordan are small producers, respectively 0,1 and 0,02 thousand barrels per day. Lebanon has no oil production. Saudi Arabia, Iran, United Arab Emirates, Kuwait and Iraq had a combined daily production of 21,9 million barrels which was 89% of total Middle East production.

In comparison North America produced 14, 53 million barrels per day, Norway 3,19 million barrels per day and Russia 9,26 million barrels per day in 2004. (EIA 2006).

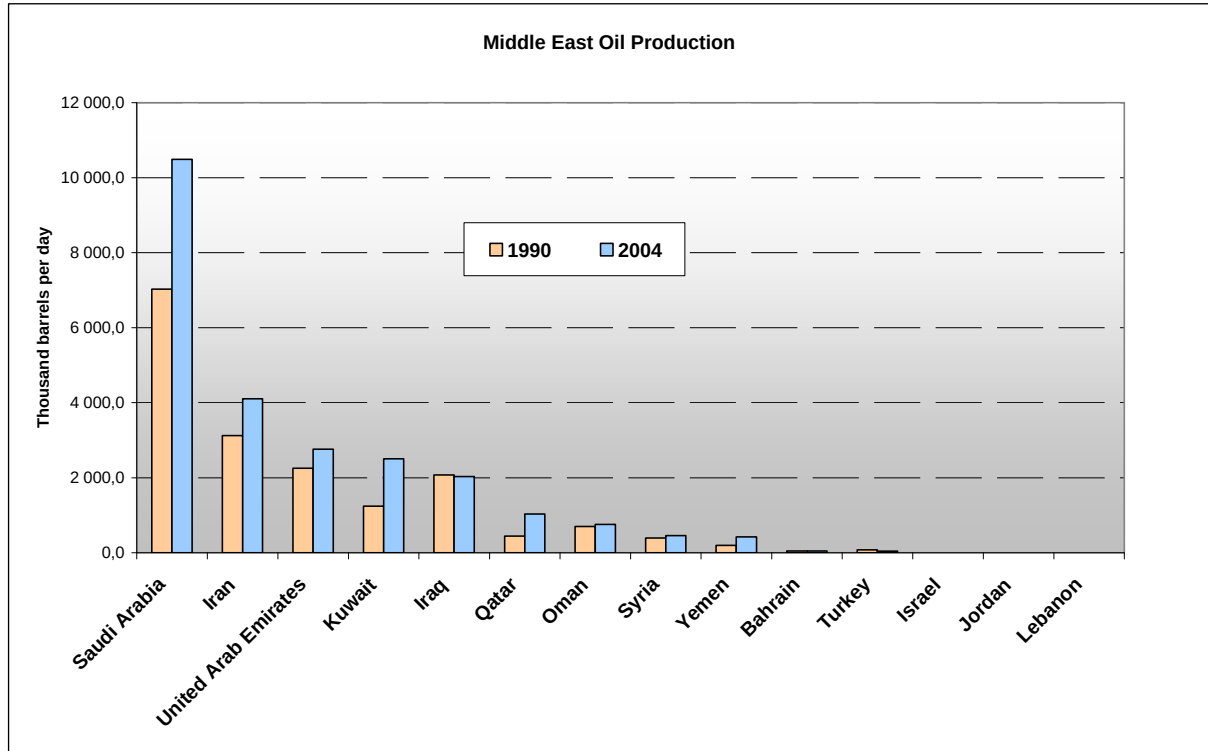


Figure 7-8: Middle East oil production (2004)

Source: EIA 2006, International Energy Annual 2004

Top World Oil Producers, 2006		
Rank	Country	Production ('000 bbl/d)
1	Saudi Arabia	10,719
2	Russia	9,668
3	United States	8,367
4	Iran	4,146
5	China	3,836
6	Mexico	3,706
7	Canada	3,289
8	UAE	2,938
9	Venezuela	2,802
10	Norway	2,785
11	Kuwait	2,674
12	Nigeria	2,443
13	Brazil	2,163
14	Algeria	2,122
15	Iraq	2,008

The Middle East's oil production is also shown in the map below (Figure 7-9), where the countries are grouped (different colors) according to the volume of their oil production.

The largest consuming country in 2006 was the US with a consumption of 20,6 million barrels per day. Iran is the only Middle East country on the top 15 oil consuming list as number 15 with a consumption of 1,6 million barrels per day in 2006.

Table 7-5: World top 15 oil producers, 2006

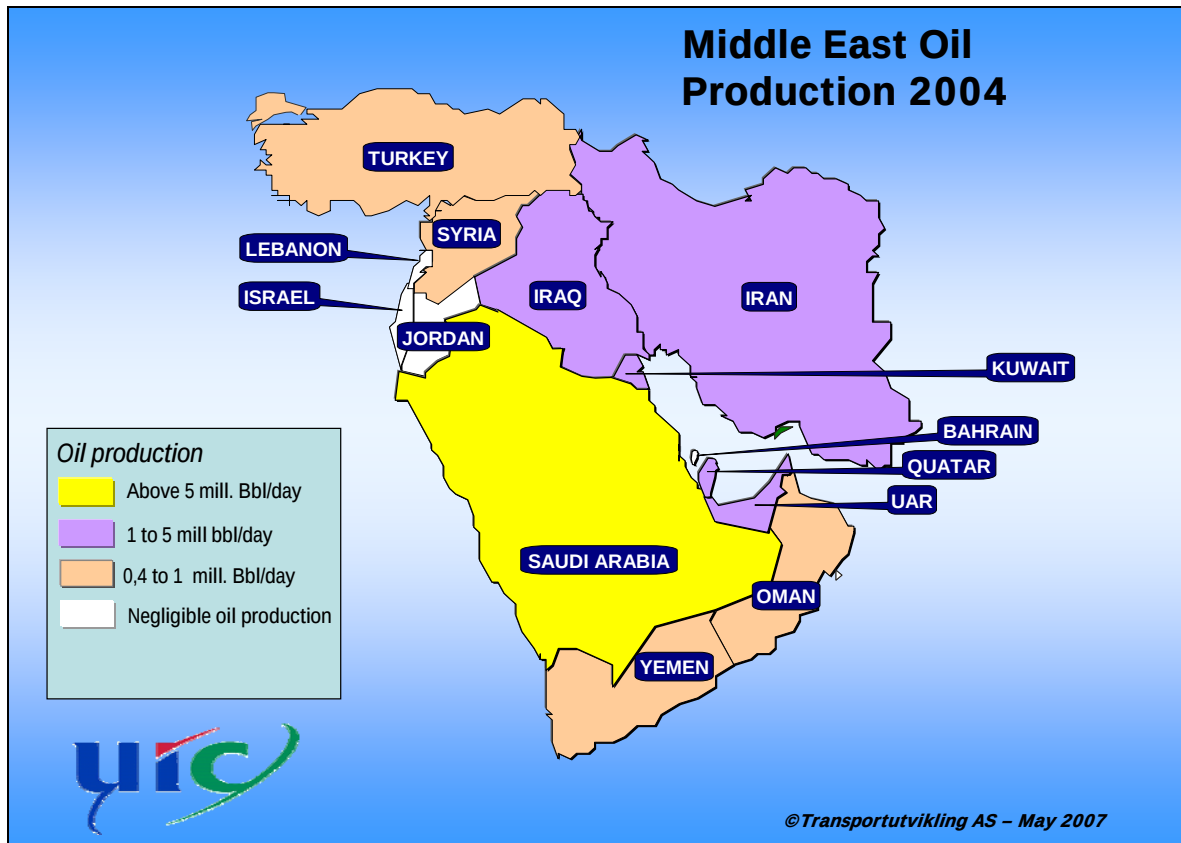


Figure 7-9: Middle East oil producers

Oil consumption

Top World Oil Consumers, 2006		
Rank	Country	Consumption ('000 bbl/d)
1	United States	20,588
2	China	7,274
3	Japan	5,222
4	Russia	3,103
5	Germany	2,630
6	India	2,534
7	Canada	2,218
8	Brazil	2,183
9	Korea, South	2,157
10	Saudi Arabia	2,068
11	Mexico	2,030
12	France	1,972
13	United Kingdom	1,816
14	Italy	1,709
15	Iran	1,627

The Middle East region has a relatively low share of the global oil consumption. In 2004, Middle East oil consumption was 6,3 million barrels per day, including Turkey. This was 7,6% of the worlds total consumption of 82,6 million barrels per day in 2004¹⁰. Turkey is included in Europe. Figure 7-10 shows the Middle East Petroleum Consumption 2004, compared with 1990.

Table 7-6: World top 15 oil consumers, 2006
(Source: EIA: *International Energy Annual* (2000-2004), *International Petroleum Monthly* (2005-2006))

Saudi Arabia is the largest consumer with a daily production of 1,9 million barrels per day. Saudi Arabia, Iran, Turkey, Iraq, United Arab Emirates and Kuwait used a total of 5,3 million barrels per day in 2004, i.e. 84% of the total consumption in the Middle East. Jordan, Lebanon, Yemen, Qatar, Oman and Bahrain used a total of 0,5 million barrels per day, 7,4% of the total. The Middle East oil consumption is also illustrated in the map below (Figure 7-10).

¹⁰ Numbers for production and consumption might not match due to changes in stock.

Saudi Arabia and Iran were the only Middle East countries with a consumption above 1 million barrels per day in 2004, and Turkey and Iraq were the only countries with a consumption between 0,5 to 0,99 mill. bbl/day. Syria, Israel and United Arab Emirates (UAE) had a consumption between 0,2 to 0,49 mill. bbl/day whereas the remaining countries have a relatively low consumption.

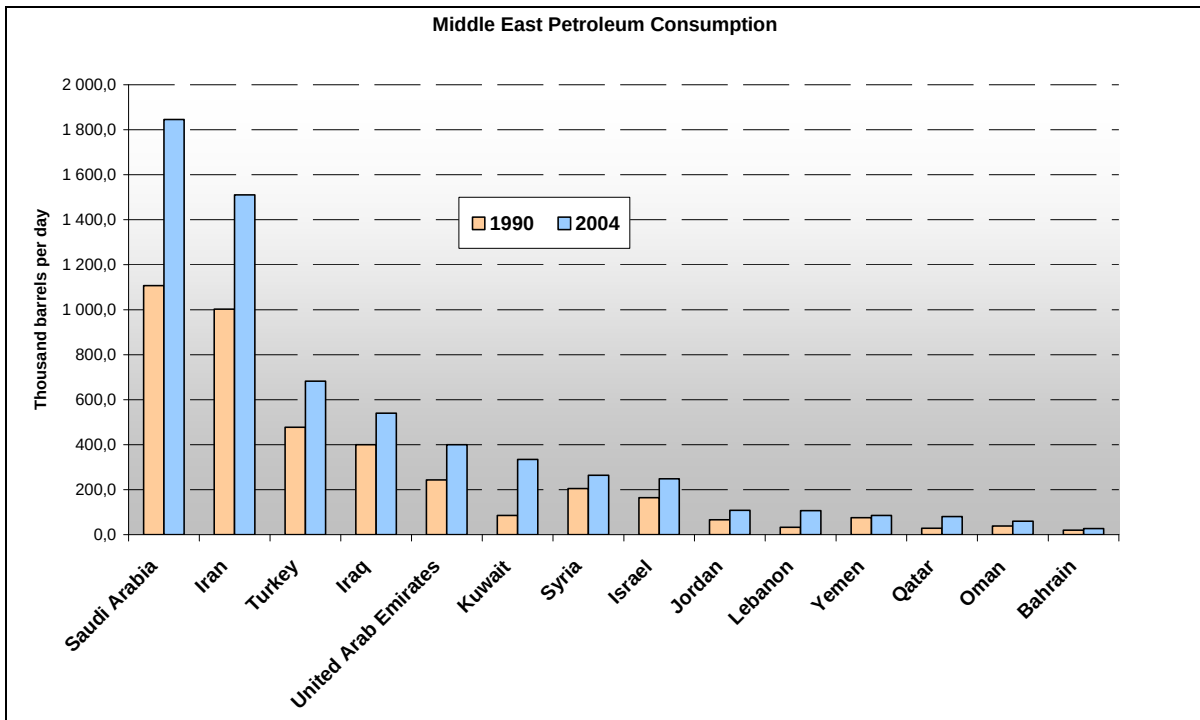


Figure 7-10: Middle East oil consumption (2004)

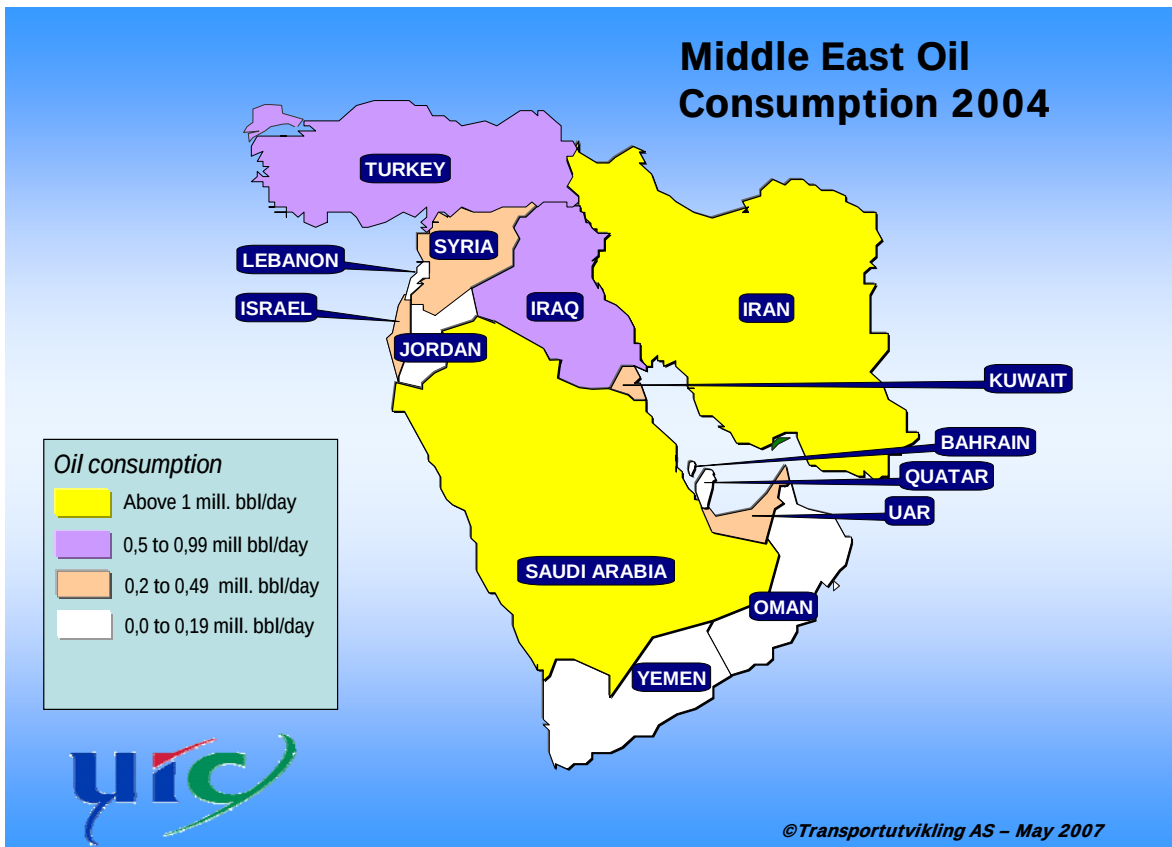


Figure 7-11: Middle East oil consumption

Source: EIA 2006, International Energy Annual 2004

The energy consumption in the Middle East is expected to grow at a rate of 2,4% annually from 2003 to 2030 (EIA, Systems for the Analysis of Global Energy Markets, 2006). Even at this relatively high growth rate, the Middle East energy consumption will still be relatively moderate compared to other regions. The main growth is believed to come in the Non-OECD Asia.

Rank	Country	Net Exports ('000 bbl/d)
1	Saudi Arabia	8,651
2	Russia	6,565
3	Norway	2,542
4	Iran	2,519
5	UAE	2,515
6	Venezuela	2,203
7	Kuwait	2,150
8	Nigeria	2,146
9	Algeria	1,847
10	Mexico	1,676
11	Libya	1,525
12	Iraq	1,438
13	Angola	1,363
14	Kazakhstan	1,114
15	Canada	1,071

Net exporters

Even though Iran is a large importer, it ranks number 4 among the world's net exporters. The large oil producing countries in the Middle East are generally net exporters. Saudi Arabia is the world largest net oil exporter, with Russia and Norway on second and third place. Iran (4), UAE (5), Kuwait (7) and Iraq (12) are all on the top 15 oil exporting countries list.

Table 7-7: Top world net oil exporters¹¹

Gas

The Middle East region has approximately 55-65% of the worlds proven reserves.

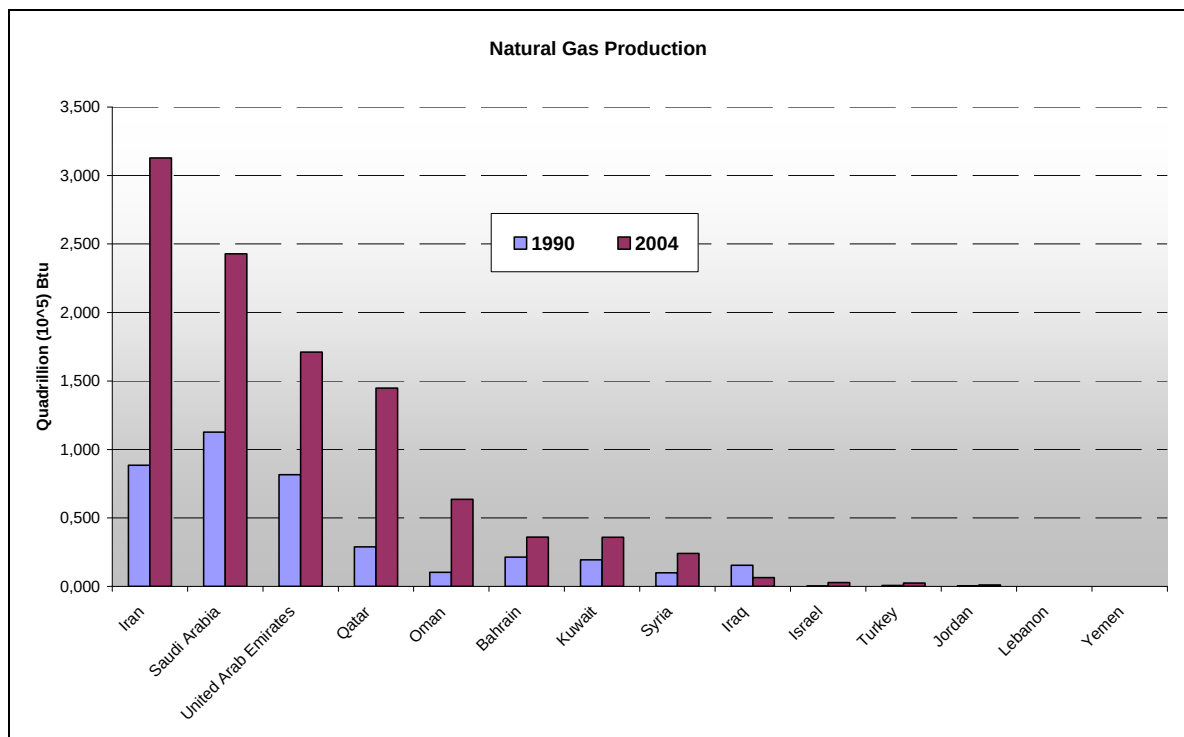


Figure 7-12: Middle East gas production, 2004

¹¹ Source: EIA: International Energy Annual (2000-2004), International Petroleum Monthly (2005-2006)

In 2004, the Middle East produced 10,2% of the world's natural gas production. The Middle East natural gas production has increased during the last years and all the major countries in the Middle East has had a large increase in Natural Gas production in the period from 1990 to 2004. Iraq is the only country with a decrease (See figure 7-12). Israel, Turkey and Jordan has had a very low natural gas production whereas Lebanon and Yemen had no production in 2004. (EIA 2007, International Energy Annual 2004)

Electricity

Electricity production in the Middle East amounted to 4,3% of the world's total electricity production in 2004. All Middle East countries has shown an increase in electricity production from 1990 to 2004. The Middle East country with the largest electricity production was Iran with a production of 156 TWh. In comparison, the US produced 3.979 TWh, France 540 TWh and Germany 567 TWh (EIA 2007, International Energy Annual 2004).

Oil and natural gas are the main source for electricity production.

The Middle East region has no nuclear production as of May 2007. (EIA, International Energy Journal). Iran has started a nuclear program which has caused debate.

The three largest electricity consumers in the Middle East are Iran, Saudi Arabia and Turkey.

The figure below shows the Middle East Electricity production (Source: EIA International Energy Annual 2004).

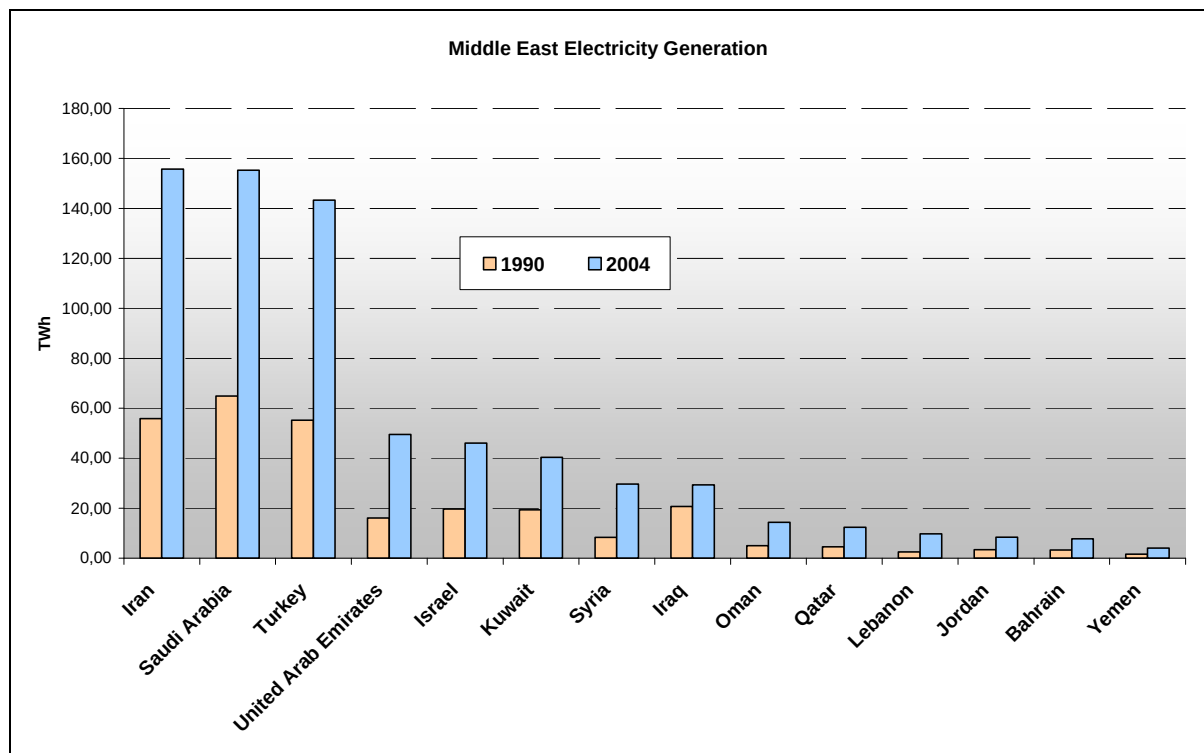


Figure 7-13: Middle East Electricity Production

Energy- and economy per capita

Per capita total primary energy consumption (TPEC) for the Middle East is on average 33.979 kWh per capita, (EIA 2006, International Energy Annual 2004). United Arab Emirates had a TPEC of 271.129 kWh per capita. Qatar (246.244), Bahrain (179.157) and Kuwait (137.701) all have TPEC per capita above 100.000 kWh. Yemen has the lowest TPEC per capita with 2.398 kWh per capita.

In comparison the US had a TPEC of 100.405 kWh, France 54.522 kWh per capita and Germany had 52.231 kWh per capita.

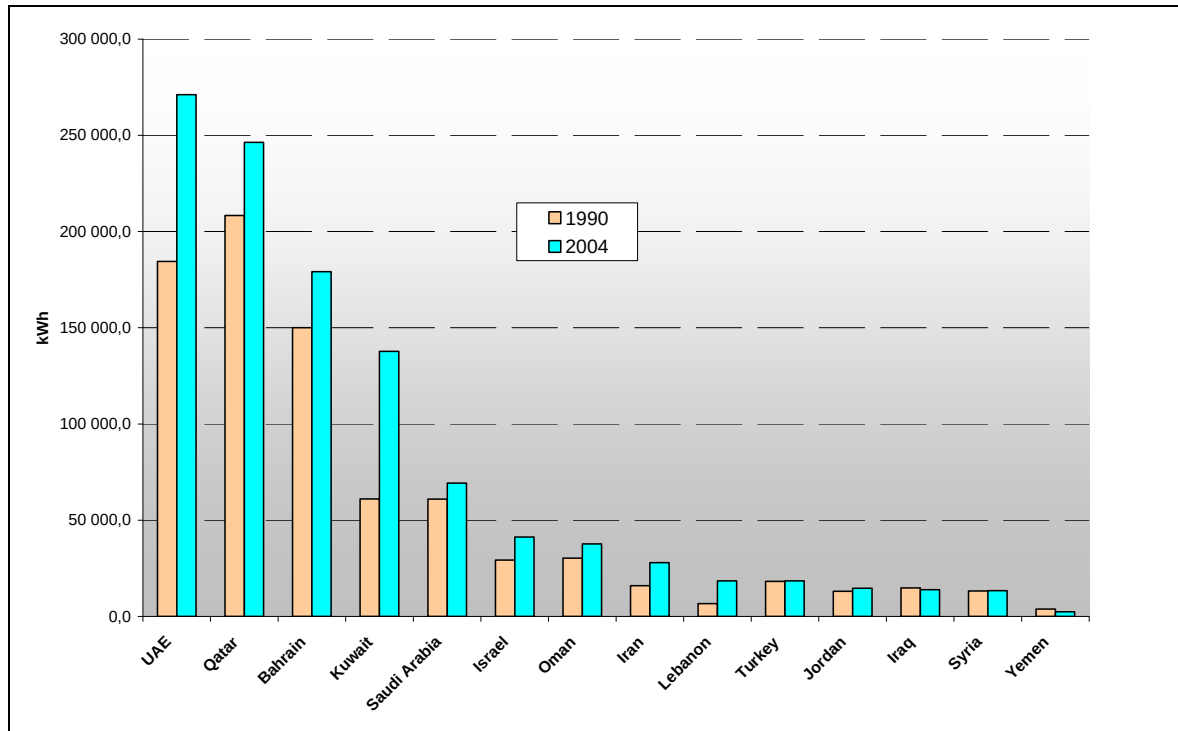


Figure 7-14: Per Capita Total Primary Energy Consumption Middle East 2004
Source EIA 2006

Except Iraq and Yemen, all countries have shown an increase in TPEC from 1990 to 2004. Syria and Turkey have remained fairly stable with an increase of 1,2 and 1,1% respectively. Lebanon has had an increase of 178%, but TPEC is still at a relatively moderate level with a per capita TPEC of 18.454 kWh, comparable to countries like Mexico (18.450), Serbia and Montenegro (20.889) and Turkey (15.024).

Energy security

Based on the projected demand for energy required to supply the transportation growth, the matter of energy security has major influence on the countries of Middle East. Not because they are net-consumers, but because a major share of their income originates from oil, and risks connected to petroleum transports will influence their economy.

Ever since the industrial revolution, energy and the need to secure the supply of energy has been fundamental for any position of power in the world. The crisis of the 70's were caused by energy, the outcomes of the two world wars were largely because of energy, and there is little doubt in the minds of most decision makers in governments around the world that the access to energy will determine who can be successful, and who will not (Kalicki, 2005; 23).

Ocean transport is the main carrier of oil products. 7.6.2 looks into security in general and AON has made a separate map where disruption of global supply chains may be influenced by various risk components. The major deep-sea trade lanes are influenced by such risk, and for some trade lanes railways are an alternative. Europe may need alternative routes for energy supply. Risk is not only a consequence of the probability for any undesired outcome, it is also a consequence of the size of the outcome. Lower volumes connected to the railways are therefore not only a drawback, it may, for some routes, help the customer to diversify and reduce risks.

7.4 Economy

Economic growth is a feature for virtually all regions of the world, albeit at different pace (*Review of Maritime Transport, 2006, UNCTAD*). Globalization is not irreversible and has strong impact on economic growth. This is shown by various economic indicators. Seaborne trade is perhaps one of the best indicators, where all major trade segments have shown growth during the last year.

Economic growth has impact on transportation and vice-versa. Furthermore, a broad set of drivers have impact on economic growth, and there are uncertainties connected to economic growth. Drivers which have impact on economic growth and transportation may be several and analysts have different views. These drivers may also be interrelating and circular, and even though analysts use different models as well as emphasizing different drivers, -they might draw similar conclusions. Drivers like population growth, investment ratio, human capital and trade openness are considered to be important drivers by serious research institutions (*Global Growth Centres 2020, Deutsche Bank Research, 2005*).

Although debate continues about the exact nature of the links between trade and growth, rapid expansion of trade, particularly merchandise trade in manufactured goods, has usually occurred in parallel with investments in capital, technological upgrading and the acquisition of new skills and knowledge, all of which have improved productivity.

7.4.1 The Gross Domestic Product¹²

Gross Domestic Product is an aggregate measure of a country's production. It is, together with other variables, considered to be a quantitative measure, indicating economic growth, and various institutions have made their predictions for the future.

Economic growth has a direct impact on transport infrastructure, development and maintenance requirements, -and traffic often increases with general economic growth.

"There is a close link **between growth in freight transportation and economic growth**" (*Bureau of Transportation Statistics, US DOT, 2006*). Empirical experience from other regions of the world may also (to some extent) be relevant when projecting the future development of the Middle East.

There are different opinions among analysts which variables are most important when measuring economic growth. However, historically, there has been a correlation between economic growth in terms of GDP (gross domestic product) and the demand for passenger and freight transport in OECD countries. Freight transport has been growing faster than passenger transport, although total vehicle

¹² Gross domestic product is an aggregate measure of production equal to the sum of the gross values added of all resident institutional units engaged in production (plus any taxes, and minus any subsidies, on products not included in the value of their outputs). The sum of the final uses of goods and services (all uses except intermediate consumption) measured in purchasers' prices, less the value of imports of goods and services, or the sum of primary incomes distributed by resident producer units.

GDP at current prices is GDP at prices of the current reporting period. Also known as nominal GDP. A fundamental principle underlying the measurement of gross value added, and hence GDP, is that output and intermediate consumption must be valued at the prices current at the time the production takes place.

This implies that goods withdrawn from inventories by producers must be valued at the prices prevailing at the times the goods are withdrawn and consumption of fixed capital in the System is calculated on the basis of the estimated opportunity costs of using the assets at the time they are used, as distinct from the prices at which the assets were acquired.

GDP based on PPP. Purchasing power parities (PPPs) are the rates of currency conversion that equalize the purchasing power of different currencies by eliminating the differences in price levels between countries. In their simplest form, PPPs are simply price relatives which show the ratio of the prices in national currencies of the same good or service in different countries

kilometers are greater for passenger transport (*OECD, 1999*). Thus, growth of GDP has been accompanied by a similar growth in overall transport demand, particularly for road transport.

While GDP in OECD countries has grown by 46 per cent from 1980 to 1995, the number of motor vehicles has increased by 55 per cent and vehicle kilometers by 59 per cent. Also growth rates in air traffic have been much higher than GDP growth rates, typically around 9 per cent per annum for passenger traffic and 11 per cent for air cargo (*OECD, 2001*).

It is often concluded from these results that transport and economic growth (in terms of GDP) are strongly correlated, and that transport growth may be higher than the economic growth.

GDP is a convenient measure to compare economic performance among countries and has been used as the aggregate indicator for economic performance. The problem is that it does not incorporate a number of activities, which are not traded. A considerable amount of passenger transports cannot be easily measured, either by the value of goods and services for which that transport is undertaken (because of non-market values), or by the resources consumed in the production of the journey (because of environmental and social externalities). Nevertheless, the GDP indicator is, by several organizations, used for analysis of trends in transport and economic activity (*Analysis of the link between transport and economic growth, OECD, 2003*)

Similar analysis have (by 2005) been performed in a more European-wide context where changes in economic activities seem to influence the demand for freight- as well as for passenger services.

Figure 7-15 shows the growth in GDP and transport of goods and passengers among the EU-25 countries from 1995 and up to 2004. The figure shows a close correlation between GDP and transportation for this group of countries. It is important to note that groups of countries contribute to diversification and there might be less visible correlation when looking at the countries one by one.

Similar indications might be shown for USA (*Bureau of Transportation Statistics, US DOT, 2006*). Even though it is often stated that freight transport has a more visible correlation with GDP, than passenger transport, -figure 7-15 may give some indications that there is a connection. The air business, which is heavily dependent of passenger transport does also include economic growth as a parameter when projecting passenger traffic; "Air travel demand is growing in all regions as a result of economic development, globalization, international trade, declining passenger fares and improved airline services." (*2006-2025 Embraer Market Outlook, 3rd Edition*). Figure 7-15 shows a more or less systematic correlation between GDP-growth and passenger transports (EU-25, 1995-2004).

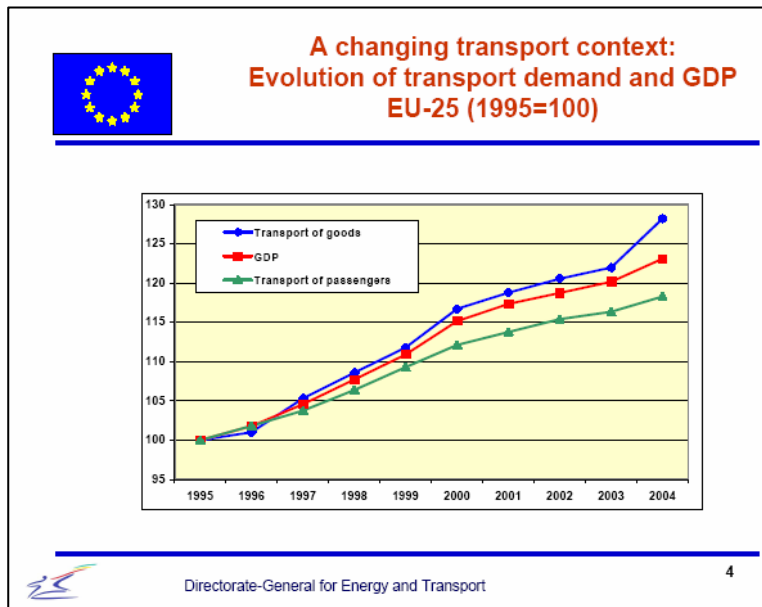


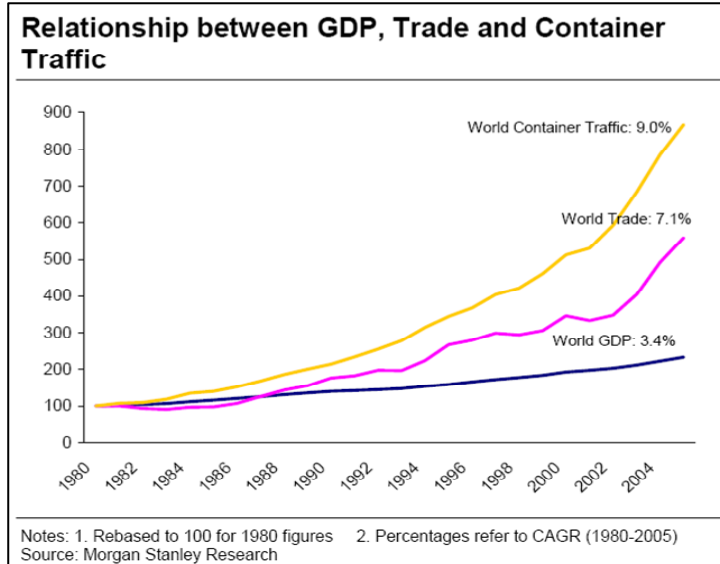
Figure 7-15: Co-variation economic growth and transportation (Europe)

(Source: "Sustainable mobility for our continent" - Mid-term review of the European Commission's 2001 white paper on Transport (June 22-2006))

Figure 7-16 shows the relation between world GDP, trade and container traffic. Historically, world trade has been growing faster than world GDP and container transports has been growing faster than world trade. The basic assumption, economic growth, for increased container traffic is also valid for

the Middle East. However, capturing this opportunity depends on the railways and the various governments' ability & will to move together with the markets requirements.

It should be noted that the co-variation between GDP and transport is not general and several conditions influence this relationship. GDP includes a price component which is not related to the volume of transports. Furthermore, structural changes in the economy influence the transport volume, as a growing service sector does not influence the transport volume as a growing industry sector does. The co variation is also influenced by capacity restrictions, which is a consequence of at broad set of variables. It has also to be mentioned that the GDP prognosis for the future is uncertain. Even if there is a relationship between GDP and transport, the outcome will be influenced by this kind on uncertainties.



Furthermore, structural changes in the economy influence the transport volume, as a growing service sector does not influence the transport volume as a growing industry sector does. The co variation is also influenced by capacity restrictions, which is a consequence of at broad set of variables. It has also to be mentioned that the GDP prognosis for the future is uncertain. Even if there is a relationship between GDP and transport, the outcome will be influenced by this kind on uncertainties.

Figure 7-16 The relation between economic growth, trade and container traffic.

7.4.1.1 Status and historical trends for the Middle East

The GDP (per capita, current USD) for the Middle East countries have generally been growing for the last 10-15 years. There is no exceptional growth, but stable with a few exceptions.

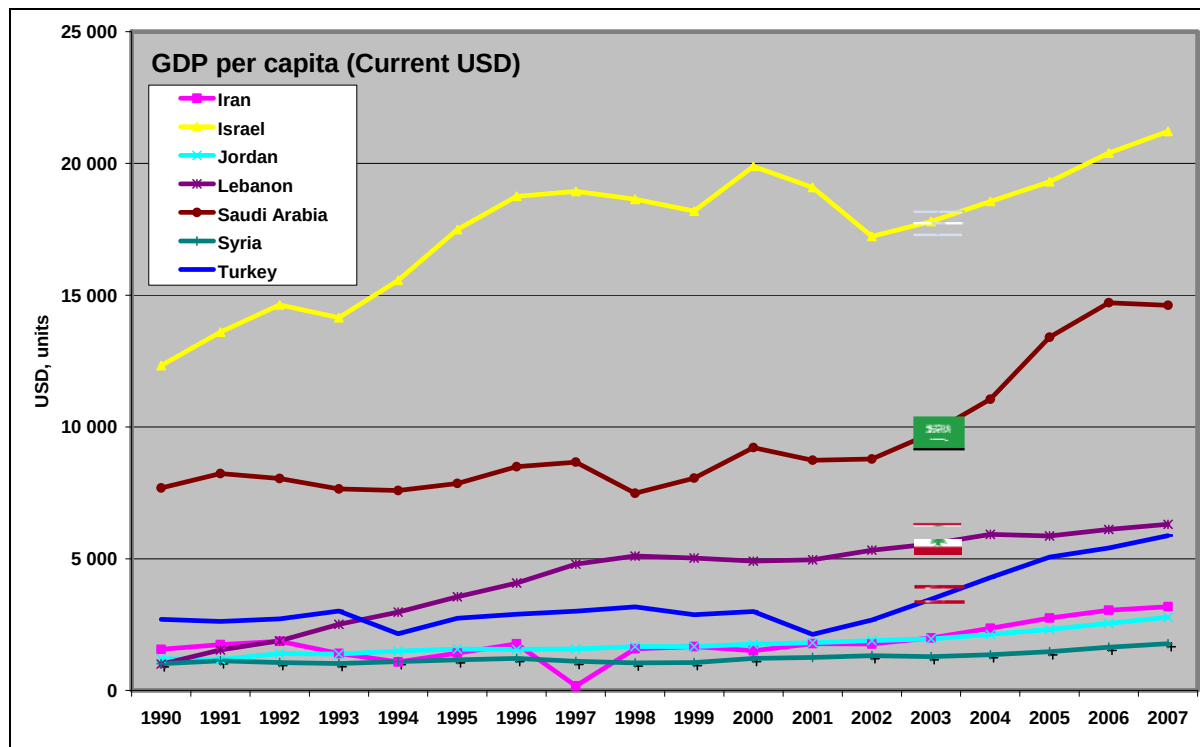


Figure 7-17: Middle East railway countries, GDP per capita 1990-2007 (USD current prices)

Figure 7-17 shows an illustration of GDP per capita from 1990 to 2007, for 7 railway countries in the Middle East. No reliable data is found for Iraq (Source: IMF, World Economic Outlook Database, April 2007).

Israel has the highest GDP per capita, while the strongest growth (%) in the period 2000-2007 is found in Iran, Turkey and Saudi Arabia.

Iran's and Saudi Arabia's high growth rate is driven by the oil sector, with record oil prices and rising petroleum production. Iran's exports are almost 80% petroleum products while Saudi Arabia's share is 90%. Turkey has a more diversified dynamic economy which may be considered as mix of modern industry and commerce along with a traditional agriculture.

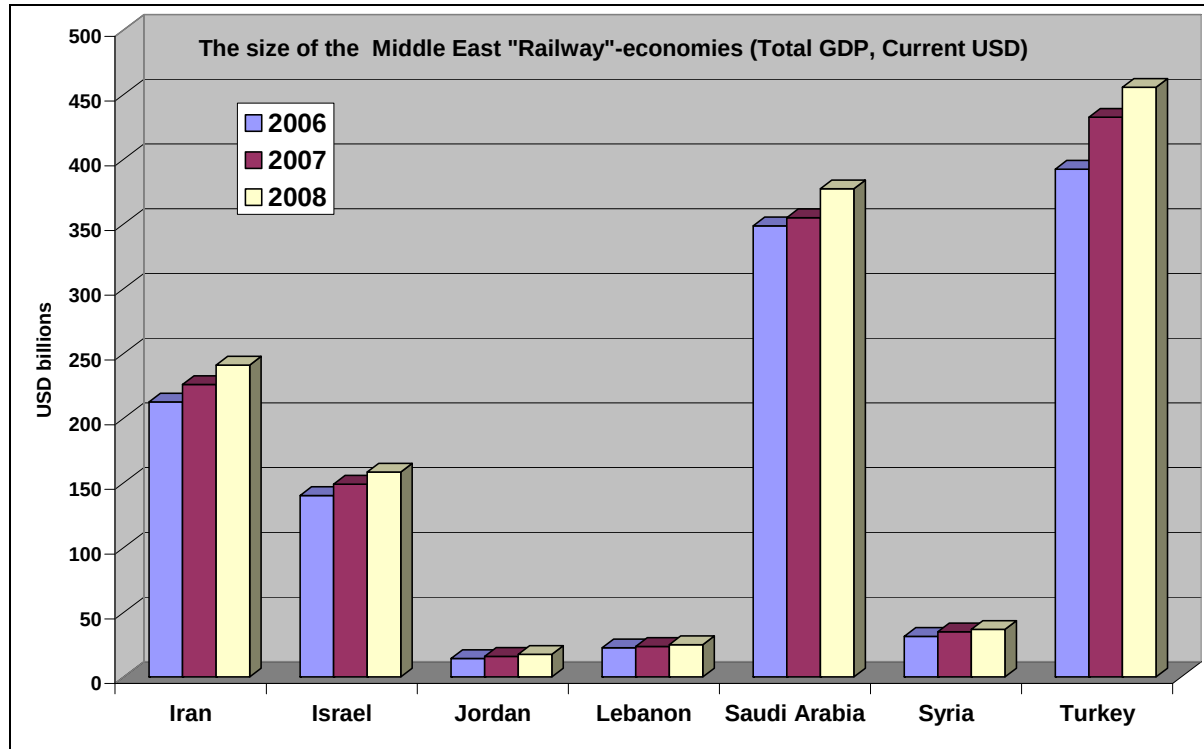


Figure 7-18: Size of the Middle East economies (Total GDP 2006-2008, current USD)

The largest economies in the Middle East (by total GDP) are Turkey, Saudi Arabia, Iran and Israel. The largest economies, except Israel, have also been the fastest growing total economies during the last years. This is shown in table 7-8 where the annual growth is (2000-2007) based on Total GDP as well as GDP per capita. It is important to notice that table 7-8 is based on current USD and this method converts the value of goods and services, using global currency exchange rates.

Annual GDP growth 2000-2007				
Country	Total GDP	Rank	GDP per capita	Rank
Iran	11,2 %	1	9,8 %	1
Israel	2,6 %	6	0,8 %	6
Jordan	8,3 %	3	5,9 %	3
Lebanon	4,3 %	5	3,2 %	5
Saudi Arabia	8,2 %	4	5,9 %	3
Syria	7,3 %		4,9 %	4
Turkey	10,2 %	2	8,8 %	2

This method can offer reliable indications of a country's international purchasing power and relative economic strength, while the use of domestic currency, or fixed prices, may show a different picture.

Table 7-8: The fastest growing economies (2000-2006)
(Source: IMF, World Economic Outlook Database, 2007, graphics by UIC)

By looking the same countries/period based on PPP¹³ (Purchasing Power Parities), a slightly different picture occurs.

¹³ A PPP exchange rate equalizes the purchasing power of different currencies in their home countries for a given basket of goods. For example, a US dollar exchanged and spent in China will buy much more than a

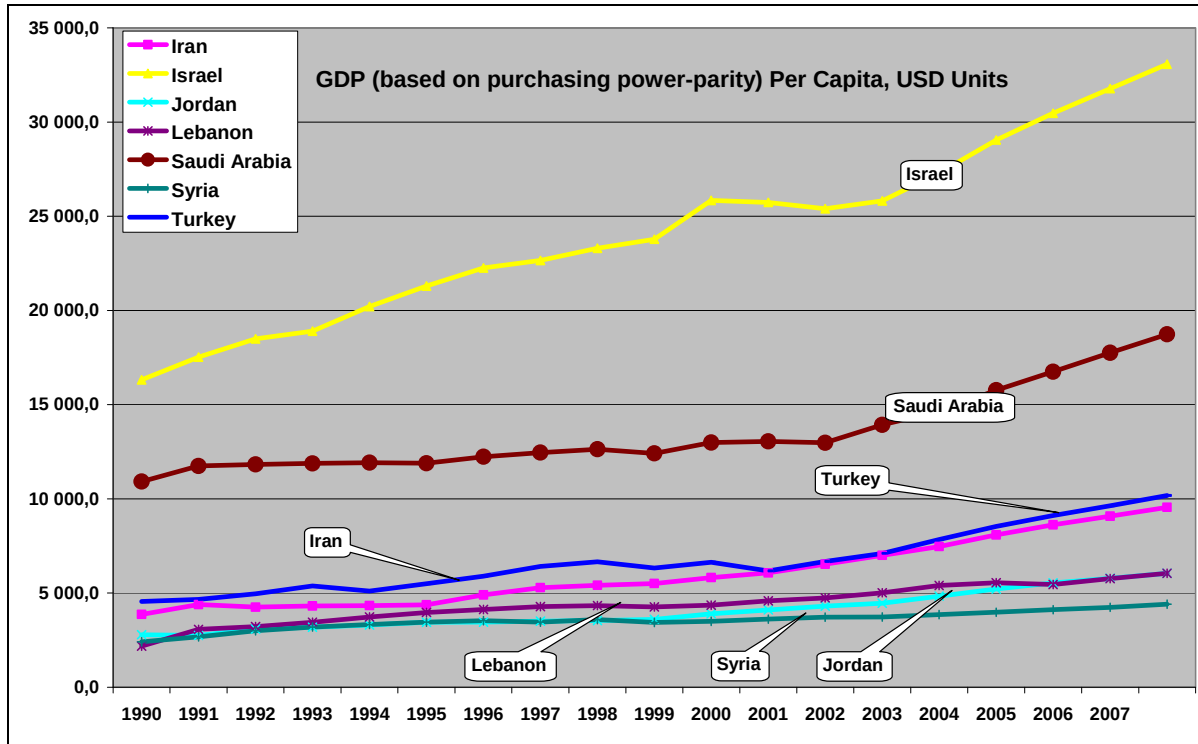


Figure 7-19: Middle East economies based on GDP, PPP per capita
Source: IMF, World Economic Outlook Database, 2007 (Graphics by UIC)

The differences between PPP and current rates can be significant, as well as by using other GDP measures. When it comes to the Middle East, there are no huge differences. Israel, Saudi Arabia, Turkey and Iran are still dominating the picture when nominal figures are considered.

Country	Annual growth 1990-2007	Annual growth 2000-2007	"Trend"
Iran	4,9 %	5,7 %	↑
Jordan	4,1 %	5,1 %	↑
Turkey	4,2 %	4,8 %	↑
Saudi Arabia	2,7 %	4,0 %	↑
Lebanon	5,5 %	3,6 %	↓
Israel	3,8 %	2,6 %	↓
Syria	3,2 %	2,4 %	↓

Smaller countries may also show positive growth, even if not recognized from the figure above. Table 7-9 shows annual (average) GDP growth for the periods 1990-2007 and 2000-2007. The country ranking are based on the 2000-2007 growth. Iran ranks on the top, followed by Jordan (small economy).

Countries growing faster during the last years (2000-2007) than the average of the entire period (1990-2007) are shown by green arrows.

Table 7-9: GDP growth per capita (PPP, USD units)

Correlation¹⁴

Historical data from many regions of the world seem to support a strong correlation between tonne-km by train and GDP development. For the Middle East railway market we can, for some countries (Iran, Israel and Saudi Arabia), verify the same patterns as we can find in many European countries and US.

For the same countries we find a quite strong correlation (0,86-0,95) between population growth and passenger kilometers by rail.

dollar spent in the USA. At the PPP US\$ rate, PPP US\$1 has the same purchasing power in the domestic economy as US\$1 has in the USA.

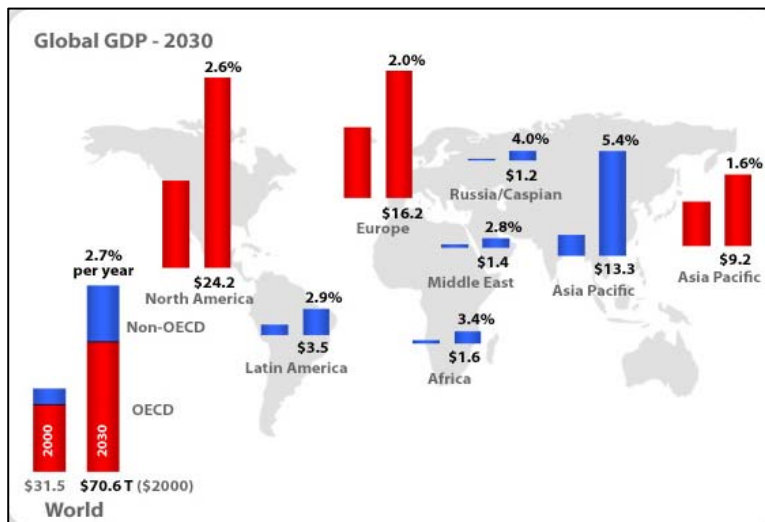
¹⁴ A measure of the interdependence of two random variables that ranges in value from -1 to +1, indicating perfect negative correlation at -1, absence of correlation at zero, and perfect positive correlation at +1. Also called coefficient of correlation

7.4.1.2 Future growth

The economic growth prospects in the Middle East region are better than the history and above world average. Economic growth estimates predict that over the next decade economic growth in Middle East will reach 4.2% per annum percent per annum, while India and other South Asian developing nations may have a growth rate of 5.4 percent per annum (See table 7-10).

A lot of uncertainties are connected to the future economic situations. As for the Middle East, the growth rates have historically been lower than the future estimates, which to some extent also can justify that many countries in Middle East are far away from their saturation point. It is also important to consider that projected economic growth rates are usually higher in developing than in developed regions, but it is not usually assumed that all developing regions will reach the level of the developed regions for many years.

Various projections for the future exist. They show different scenarios and growth rates, but they all conclude with future growth in Middle East. Most projections are based on information from international organizations like World Bank, United Nations, IMF, OECD etc. OECD expects World Growth (GDP) to be an average of 3.5% from 2006 to 2025 and that the main growth will come in the developing regions of the world.



ExxonMobil has looked at the prospect until 2030 (with reference year 2000) and indicate an annual growth of 2,8% for the non-OECD nations in Middle East (real figures 2000). The conclusions from ExxonMobil's analyzes are shown in figure 7-20 (Source: Long-term outlook, ExxonMobil, 2006). The two columns (per region) show the GDP level in 2000 (left column) and the expected level in 2030 (right column). Blue columns are non-OECD nations.

Figure 7-20: World economic growth, 2030

The projections in the table below are made by US Energy Information Administration (International Energy Outlook 2006) and it shows average real growth rates per year (based on 2000 level) for various regions and countries from 1978 to 2030.

Middle East is expected to show exhaustive growth from 2003 to 2030 (Table 7-10: Economic Growth Projections 2030 (International Energy Outlook, 2006)) and is in reality only bypassed by non-OECD countries in Asia (like India and China) and CIS-countries.

The projections for Middle East are 4.2% per year from 2003 to 2030, which is almost the same as for Africa. Non-OECD countries are expected to grow by 5% per year and OECD countries by 2.6% per year.

Figure 7-21 shows (Global Insight, 2005) expected annual GDP growth rates for the period 2005-2025. This scenario does also support strong growth for Middle East (4.1%), ranking behind China, India and Africa.

The railways of the Middle East – Vision 2025

Region	History				Projections		
	1978-2003	2003	2004	2005	2005-2015	2015-2030	2003-2030
OECD North America	2.9	2.5	4.1	3.5	3.1	2.9	3.1
United States	2.9	2.7	4.2	3.6	3.1	2.9	3.0
Canada	2.8	2.0	2.9	2.9	2.6	1.8	2.2
Mexico	2.9	1.4	4.4	3.1	4.0	4.1	4.1
OECD Europe.....	2.4	1.4	2.6	1.9	2.3	2.1	2.2
OECD Asia	3.0	1.9	3.0	2.6	2.3	1.6	1.9
Japan	2.5	1.4	2.6	2.4	1.7	1.0	1.4
South Korea	6.7	3.1	4.7	4.0	4.7	2.8	3.6
Australia/New Zealand	3.3	3.2	3.6	2.3	2.5	2.4	2.5
Total OECD	2.7	2.0	3.4	2.7	2.7	2.4	2.6
Non-OECD Europe and Eurasia ...	-0.3	7.7	8.1	6.5	4.9	3.7	4.4
Russia	-0.5	7.3	7.2	6.1	4.2	3.3	3.9
Other	0.2	8.0	9.5	7.0	5.9	4.0	5.1
Non-OECD Asia	6.7	7.6	7.8	7.5	5.8	4.9	5.5
China	9.4	9.1	9.5	9.2	6.6	5.2	6.0
India	5.3	8.5	6.9	6.8	5.5	5.1	5.4
Other	5.4	4.8	6.0	5.4	4.9	4.3	4.6
Middle East	2.6	4.8	6.4	6.7	4.4	3.7	4.2
Africa	2.9	4.8	5.1	4.9	4.8	4.1	4.4
Central and South America	2.3	2.1	5.9	4.5	3.8	3.5	3.8
Brazil	2.5	0.5	4.9	2.7	3.7	3.3	3.5
Total Non-OECD	3.7	6.4	7.2	6.7	5.3	4.5	5.0

Table 7-10: Economic Growth Projections 2030 (International Energy Outlook, 2006)

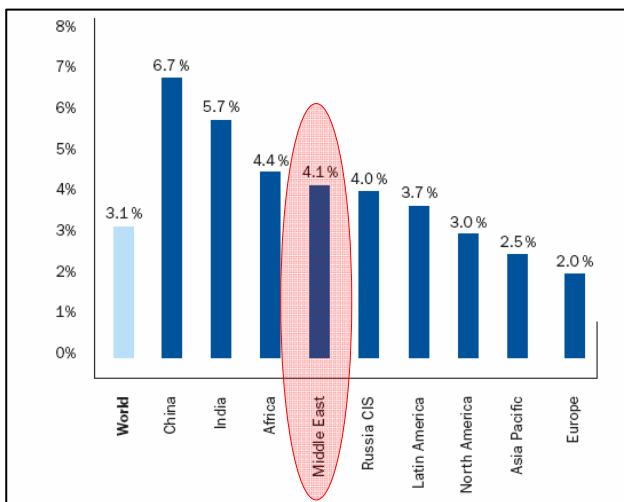


Figure 7-21: Economic growth prospects 2005-2025 (Global Insight, 2005)

We would like to stress that the future is unsecured and that there are factors which can dampen the projected economic growth. Growing inflation and currency policy are such issues. Furthermore, the projections do not take into considerations like world recession.

Some analyst believes that a world recession is a likely outcome from the economic turbulence caused by financial market in USA. So far (as per early 2008) the US slowdown has not seriously affected the Middle East countries.

7.4.2 International trade

The Middle East's international trade (exports and imports) has been growing during the last few years. From 2000-2006 exports have been growing by 16% and imports by 14%. This is above the world average which 11% (import as well as export) during the same period (Source: WTO)

Figure 7-22 (below) shows Middle East's share of world trade since 1948 and until today. The Middle East has increased its share of the world trade and from 1948 to 2005 the share has increased from less than 2% to more than 5%.

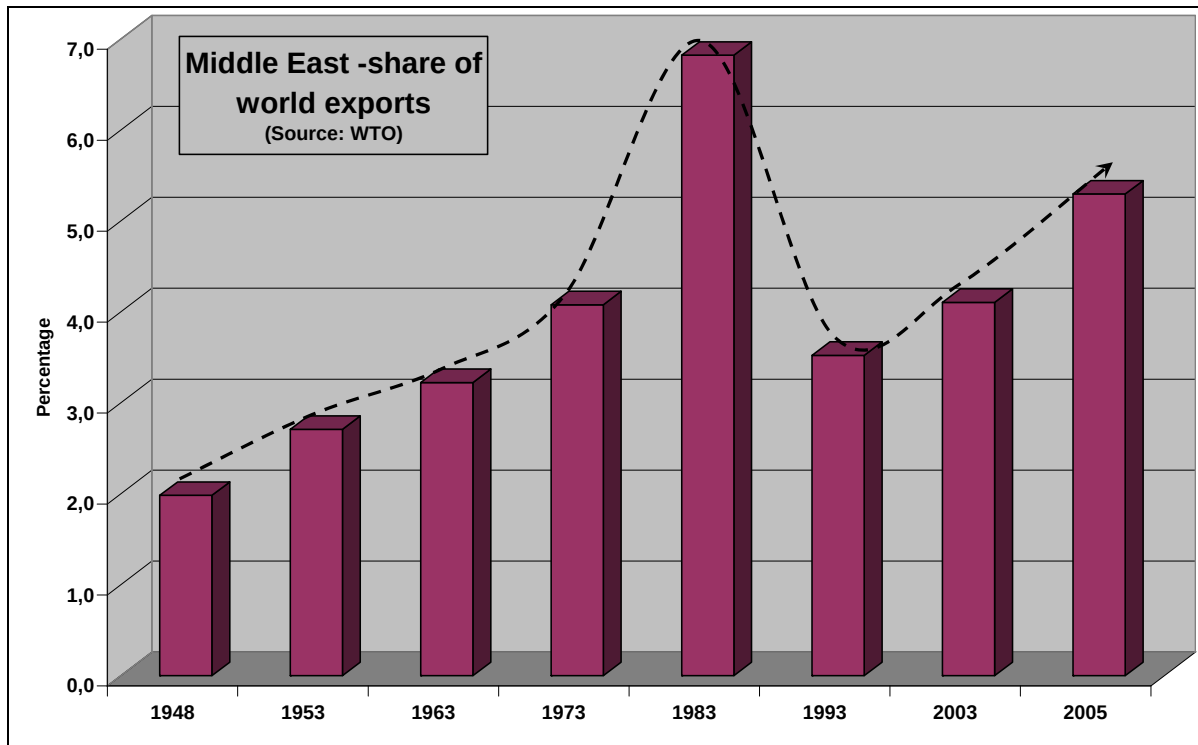


Figure 7-22: Middle East share of world trade (exports)

The Middle East's share of world trade is higher than their global share of population and the trade balance is dominated by export of raw-materials, -mainly petroleum products. The trade is imbalanced and more than 70% of the export is fuel and mining products, while 80% of the import is manufactured goods.

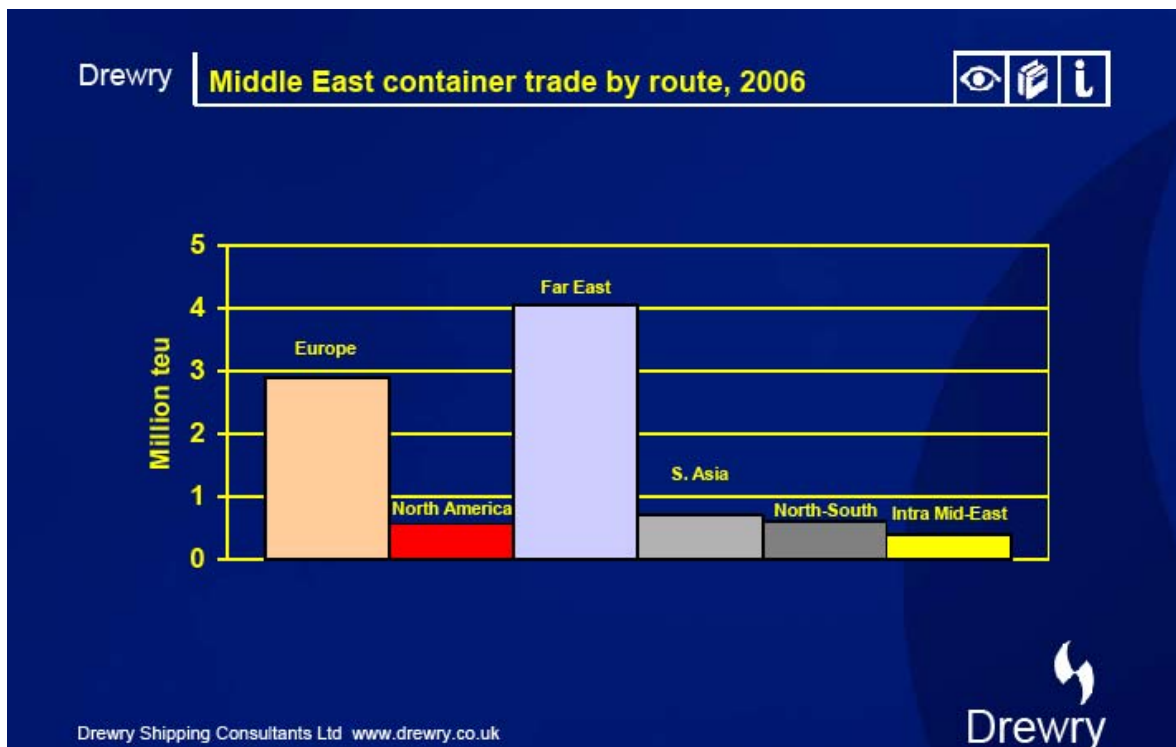


Figure 7-23: Middle East container trade by route (2006)

The Middle East's main trade partner is Asia (total export + total import). This is not a surprise, since 50% of the global market is found in the Far East and South East Asia. The second largest trade partner is North America and the third is Europe. 52,2% of exports are related to Europe (2005)

Figure 7-23 shows container between the Middle East and the rest of the world. The figure illustrates the importance of Far East and Europe. The statistics is based on port information and includes transshipped containers (*Source: Drewry, January 2008*). Trade among the Middle East countries accounts for only 10% of their total exports and imports (WTO). 40% of North American trade is with other North American countries and 68% in Western Europe is with other Western European nations.

The lack of intra-Middle East trade is a missed opportunity, because increased trade between countries creates a demand for better roads and railways, which the Middle East needs, and provides the wealth to build and maintain them.

Even though some blame the continuing low level of trade on poor transport, it is probably more than one trade barrier which has created this situation. Effective improvements can most probably only happen through various measures (formal and informal trade barriers, infrastructure investments etc).

In Asia (UIC Visions 2025 for Asia) there were projections which indicated that a larger Asian economic community is already emerging. The same is not obvious for the Middle East. But, even though the intra-Middle east trade is small, -it has been increasing since year 2000 (8%).

The trade flow between the Middle East countries and the rest of the world is expected to grow and the growth in trade has a direct consequence for international transportation, particularly container transports, which is also the most suitable loading unit for international railway transports.

7.4.3 The economic structure

An expanding manufacturing sector usually creates increasing demand for railway transports. Historically, a raise in the per capita GDP tends to be accompanied by a decline in the share of the GDP occupied by the agricultural and manufacturing sectors, which means a raise in the share occupied by the service sector. Japan is an exception in this regard; in spite of the rise in its per capita GDP, its manufacturing sector share has been declining slower, and its service sector share is mowing slower than in many other countries (A Long-term Perspective on Environment and Development in the Asia-Pacific Region, Asian Development Bank, ADB, 2005).

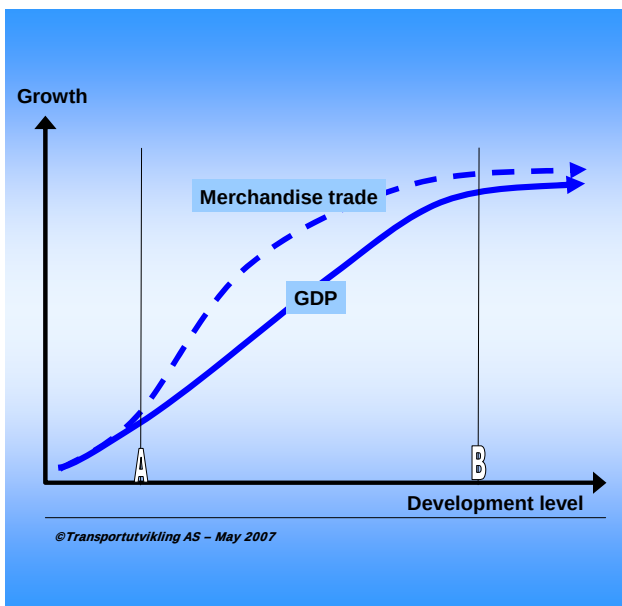


Figure 7-24 intends to show that when GDP is growing, merchandise trade is normally growing and usually at a higher level than GDP. However, we can not expect that merchandise trade is growing faster than GDP before a certain level of basic development conditions are fulfilled (A), -e.g. relevant infrastructure and business climate. The figure does also indicate that developed countries have a larger share of service industry and a lower relative share of manufacturing industries. This structure creates a lower share of physical transportation needs. The economic structure, future prospects for this structure, development of infrastructure, management and business climate are of crucial importance for the development of railway transports.

Figure 7-24 Trade and development levels

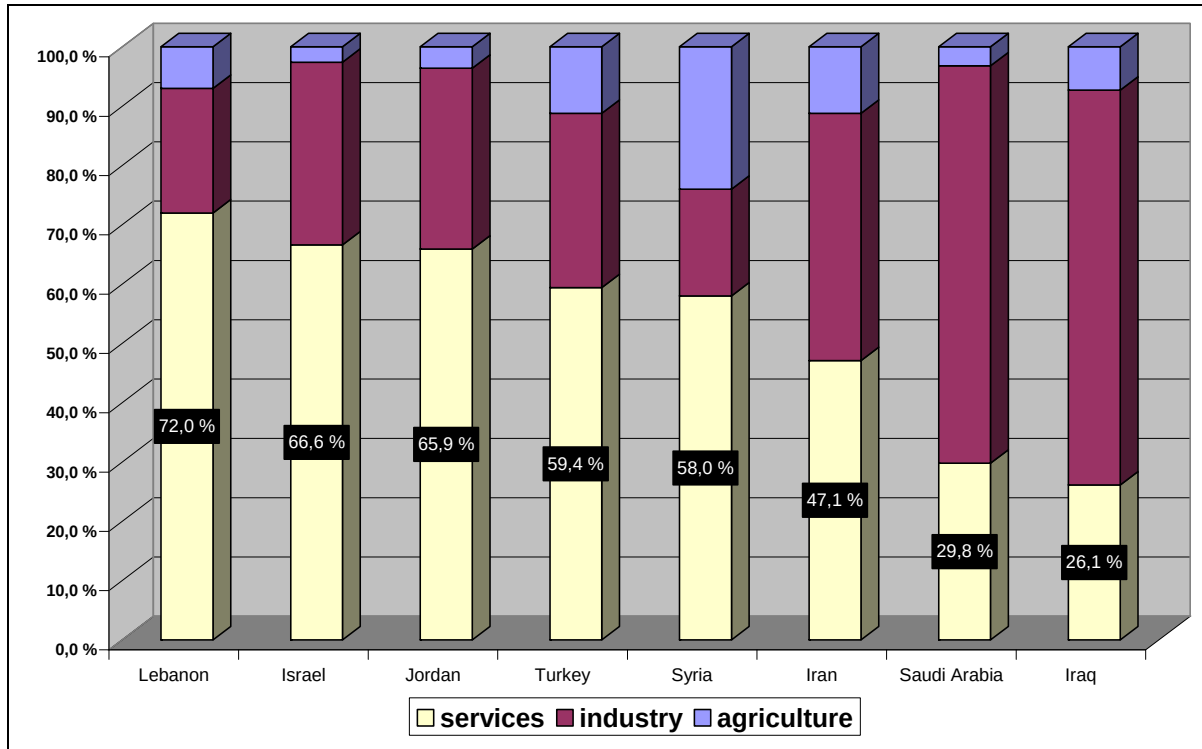


Figure 7-25: Middle East GDP composition by sector and country, 2006

Figure 7-25 shows that most Middle East countries are dominated by the service sector. However, large economies like Iran, Saudi Arabia and Iraq have a large industrial sector. In many Middle East countries we also find huge investment projects in heavy industry (petrochemicals, plastics, fertilizer etc) which will impact the demand for transportation. An example of transportation spin-offs is China Harbour which recently was awarded a \$600 million contract to build new aluminum and fertilizer port at Ras al-Zour in Saudi Arabia.

7.5 Transportation issues

The projections aim to indicate a possible future development of the Middle East railways. It is therefore relevant to include the transport sector itself as one of the main drivers. The transport sector includes a broad set of different factors, and some are more relevant than others. Many of them are also mutually interdependent.

Transport encompasses the demand for movement of passengers and freight, both influenced by various aspects. Due to market competition it is very important to consider the development within other modes of transport, such as road, sea and air. Furthermore, several issues within the railway sector need to be mentioned as part of this chapter, like different gauges/discontinuous points, technological development, efficiency/capacity etc. They all have impact on the outcome.

7.5.1 Alternative transport methods

Historically, the demand for transport has been increasing. There will be an increasing demand in the future and this demand has to be covered by a supply side accepted by the buyers of transportation services. Transport modes are competing on transport routes where competition is possible. This competition will probably continue to be intense. The competitive advantage differs between the means of transport, dependent on type of goods, geographical issues, time-aspects, comfort, economies of scale, reliability, political conditions etc. The development of alternative transportation

influences future railway traffic. There might therefore be a direct connection between railway transport and alternative transports as competing modes, - i.e. high price elasticity for some routes.

Air

On certain long-distance passenger routes, -air transport competes with the railways. Generally, air transportation is heavily dependent on oil prices. Oil, which is a price-volatile commodity, has become a key determinant in the profitability of airlines. Flight charges/tickets are usually vulnerable for shift in oil prices and increasing oil prices are usually transferred to the customers if the companies intend to maintain their nominal profit contribution. However, this fundamental shift will also add further pressure to airframe and engine manufacturers to create more fuel-efficient designs, and cause airlines to move to larger capacity aircraft with lower fuel burn per seat. Moreover, high fuel prices will have an impact on the aircraft retirement cycle by pushing less fuel efficient types out of the market at a faster pace. (Bombardier,2006).

Transportation time is an important issue. The speed of air transport, compared with other transport modes establishes air transport more preferable on longer passenger distances and for certain commodities. By utilizing the present airplane technology it is not very efficient to transport heavy goods by planes, due to the limited weight load capacity.

Incidents like the terror attack on September 11th 2001 have an impact on air transport, particularly in a short term perspective. Stricter security and safety regulations did also lead to increased check in-delays, schedule reductions of 15% and higher costs (Stengel 2002). This altogether made alternative transport modes more attractive. On the other hand, the terror attacks in Madrid, London etc have proved that this is applicable for all types of transport. Passenger transports by air (20-99 seats) has been growing at rate of 11% per annum the last 25 years, and it is expected that the growth will continue.

Air freight does also play an important role in the competitiveness of Middle East freight in world markets. Traditionally, air freight carriers have had a stopover in the Middle East; halfway along the major trade lane Asia-Europe, to refuel, and this maximizes freight loads on the aircrafts (Booz/Allen/Hamilton, 2006).

Low-price air transport is growing, as a competitor to the railways. This situation does also occur in many Middle East countries and the railway should look closer into on which routes their competitive advantages are strongest. On certain trades, there are obvious synergies between passenger transport by air and railways transports, like charter tourism where railway transports could be an important element of the overland charter package.

Road

Connected to the development of modern high speed road infrastructure, trailer trucks, express busses and personal vehicles, - road transport is becoming a real competitor to trains regarding passenger and freight transportation. A major problem concerning road transport is congestion and various external costs (see environment, chapter 7.2). Congestion is a global problem in various regions of the world and there are serious problems on the roads in many countries.

According to the United Nations (UN Population division, 2007), the urbanization process is to continue towards 2030. They predict an increase in the urban population in all countries in the Middle East from 2005 to 2030 (see chapter 7.1). This means that between 60% and 90% (depending on country) of the population will be urbanized by 2030. The strongest growth is to be found in Iran, Turkey and Syria.

Studies do also show that motorization grows continuously in strong relation with the increasing per capita income (Schipper, Lilliu and Lewis-Davis 2001).

Since GDP per capita is expected to rise in the Middle East (IMF, World Bank etc), the number of cars is likely to increase considerably. This again may generate more severe congestion problems, - particularly in large cities.

As congestion to some extent can be relived by railway transport, much of the future depends on if public investment flows are canalized to road or rail.

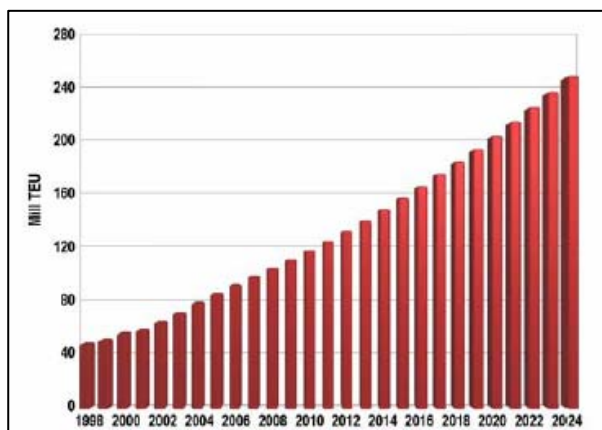
Several countries in the Middle East are working on large road projects, like connections between Iran and Iraq (Minister Rasmathi, Thereran, 15-7-07).

Sea

Today, in terms of volume, approximately 90% of the world's trade is handled through sea ports (Major origins and destinations, China-Europe container trade, Transportutvikling AS, 2005). Ocean carriers have a competitive advantage with regards to international transports, large volume transports and various bulk/heavy transports. Although rail is suitable for transport of oil onshore, ships often offer more efficient transfer on long international distances and on trade lanes where sea and rail are competitors. This situation does also occur along the coasts¹⁵ of Middle East. Compared with rail, sea transports have several advantages when it comes to bottlenecks, discontinuous points, economies of scale¹⁶, tariff barriers etc. Ocean carriers have also been operating in markets characterized by strong competition, which have influenced the quality and standard offered to the customers.

The railways' lack of competitiveness is also due to natural endowments on certain routes (such as geographical conditions), but also caused by the various country-specific obstacles (political situation, operational standard etc) in many of the countries in the Middle East, as well as countries linked to the Middle East railways.

In 1956, Malcom Purcell McLean developed the metal shipping container, which replaced the traditional break bulk method of handling dry goods. He revolutionized the transport of goods and cargo worldwide. 50 years later, more than 300 millions TeU's are handled by the 100 largest container ports of the world. Container transport has been growing rapidly, and by 2006 the level is 9-10 times higher than in 1980. Historically, world trade has been growing faster than world GDP and container transports has been growing faster than world trade. The basic assumption, economic growth, for increased container traffic is also valid for the Middle East. However, capturing this opportunity depends on the railways and the various authorities' ability & will to move together with market requirements.



Projections made for the shipping industry (ISL Market Analysis 2005), project world container trade to grow from less than 100 millions TEU's today to more than 240 million TEU's in 2025. 50% of this container volume is expected to come from China.

Figure 7-26 shows total projected global trade flow in millions of TEU's.

Figure 7-26: World growth projections, container traffic

The global ports statistics shows approximately 500 million moves over the quays as per 2007. By 2015 this number is expected to reach 1 billion TEU's.

The Middle East region is easily accessible by sea and the region is increasingly becoming a hub for sea transport. Middle East's total seaborne trade is imbalanced, mainly due to export of oil.

¹⁵ The Mediterranean, the Red Sea, the Persian Gulf, the Black Sea and the Caspian Sea.

¹⁶ Ships are growing bigger and bigger. As per January 2008 more that 200 container vessels, larger than 10.000 TEU are ordered.

However, even if the overall trade is imbalanced (due to large volume sea carriers) there are options for the railways, as regards lower volume requirements. The Middle East has several international ports where cooperation between sea and rail is possible

7.5.2 Middle East ports

The Middle East has a huge number of ports. All countries have a coastline and they have operational ports. The largest ports are not linked to the railways systems. Depending on the trade structure in the respective countries, there is a wide variation among the ports. (and large oil-exporting countries by liquid-bulk ports).

From 1974 to 2004, the seaborne loaded goods grew by 60% and four Middle East nations figured on UNCTAD's list of the top 35 maritime nations (Saudi Arabia, Iran, Kuwait and UAE).

As per early 2008 there are tremendous port expansion and new building plans in the Middle East. New ports are planned in for instance Bahrain (Khalifa bin Salman Port), Abu Dhabi (Khalifa Port), Qatar, Kuwait (Bubiyaan), Saudi Arabia (KAEC and other industrial cities), Oman (Duqmpland) etc. Expansion plans are found in almost all ports. A few of them are: Oman (Salalah), Dubai (Jebel Ali), UAE (Khor Fakkan), Saudi Arabia (Dammam, Jeddah), Iran (Chabahar, Bandar Abbas) etc

The intermodal containerized transport is growing fast and the growth among the largest container ports in the Middle East was 14% from 2004 to 2005. In 2005, the total number of TEU's reached almost 21 million among the 10 ports. Growth is shown for almost all ports in the Middle East, however, the war in Iraq and Lebanon has caused sharp drops in their ports' throughput, showing that peace & stable business climate is crucial to the Middle East's container trade. Among the top-ten container ports, only one showed decrease from 2004 to 2005.

The 10 largest container ports in Middle East handled the overall majority of the container throughput in 2005. The largest port is Dubai (Jebel Ali), located in the Persian Gulf (UAE). Jebel Ali is handling 36% of the total top-ten volume. The second largest port is Jeddah (Saudi Arabia) and the third is Sallah (Oman). None of these ports have railway connection.

The largest container port with railway connection is Bandar Abbas (Shahid Rajaei) in Iran, closely followed by Ambarli (Turkey) and Haifa (Israel).

Bandar Abbas container terminal (Shahid Rajaei) handles 90% of the Iranian container volumes are the main Iranian port for the International North South Transport Corridor, INSTC (see chapter 9.4). A new terminal is under construction in order to increase the Shahid Rajaei Container Terminals Capacity from 1.5 million TEU's to 6 million TEU's. Phase 1 of the project is almost completed and phase 2 is expected to be completed around 2010. (Source: Behzad (Mohammad) Seifollahi, Managing Director and Board Member, Tidewater Middle East Marine Services Company, January 2008). Today, Iranian ports are not called by US and Israelian vessels.

The top-11 ports are shown in table 7-11 and figure 7-27 (Source: Port statistics, various)

Largest container ports in the Middle East							
Port	Country	Location	Rail connection	TEU 2004	TEU 2005	Growth 2004-2005	W-rank 2005
Dubai (*)	United Arab Emirates	Persian Gulf	No	6 428 883	7 619 219	19 %	9
Jeddah	Saudi Arabia	Red Sea	No	2 425 930	2 835 000	17 %	27
Salalah	Oman	Arabian Sea	No	2 229 000	2 492 000	12 %	35
Sharjah ports (**)	United Arab Emirates	Persian Gulf	No	2 003 620	2 157 899	8 %	41
Bandar Abbas	Iran	Persian Gulf	Yes	1 143 000	1 293 000	13 %	69
Ambarli	Turkey	Sea of Marmara	Yes	1 078 406	1 186 041	10 %	72
Haifa	Israel	Mediterranean	Yes	1 032 649	1 107 000	7 %	77
Dammam	Saudi Arabia	Persian Gulf	Yes	743 457	898 110	21 %	84
Izmir	Turkey	Aegean Sea	Yes	804 565	784 000	-3 %	92
Mersin	Turkey	Mediterranean	Yes	529 000	596 289	13 %	112
Ashdod	Israel	Mediterranean	Yes	545 000	586 000	8 %	116
TOTAL				18 963 510	21 554 558	14 %	

Table 7-11: Top-11 Middle East Container ports, ranked by 2005 figures

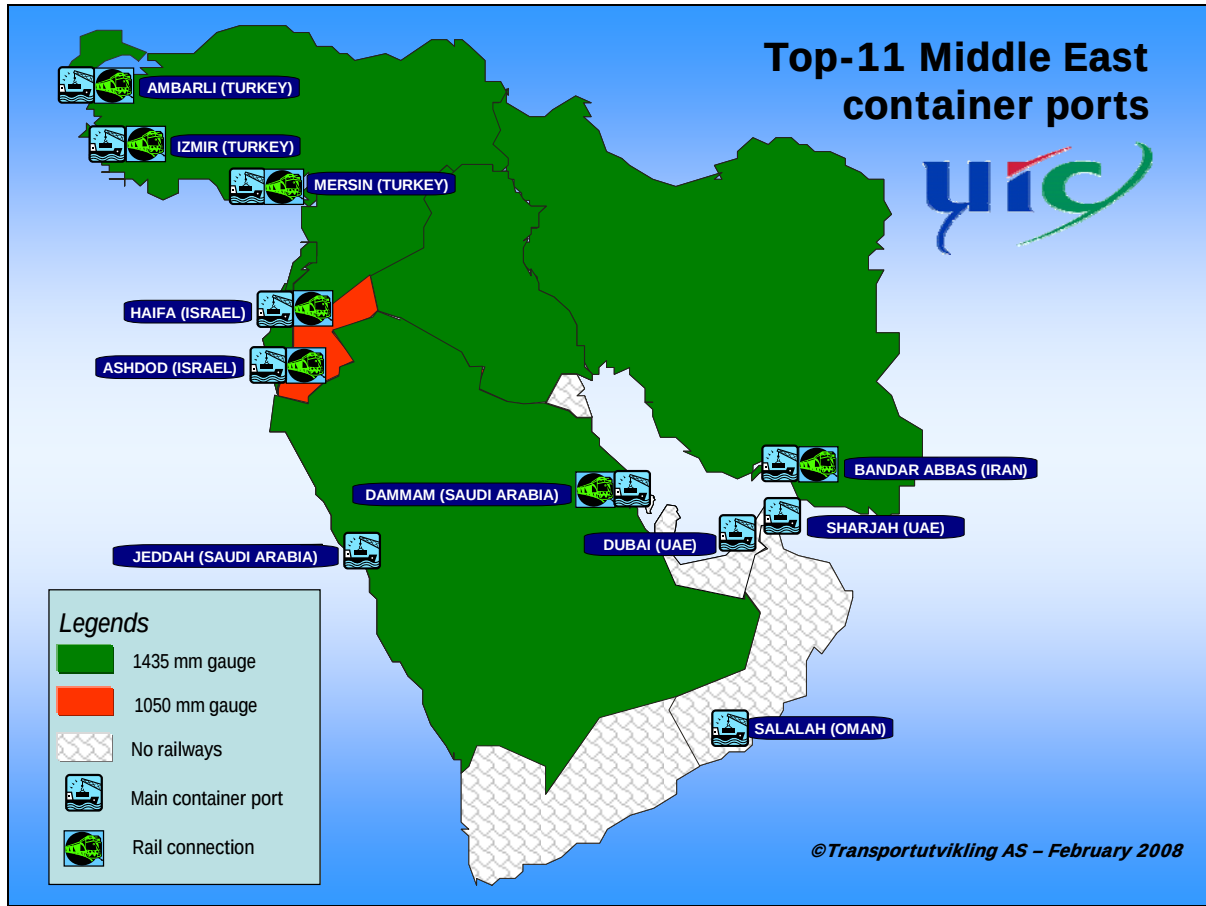


Figure 7-27: Top-11 Middle East container ports (2005)

DP World Jebel Ali – Innovation in Action

Innovation –
DP World uses the largest cranes in the world and the first with Quad-Container lift capability.

MSC Pamela –
At 9,200 TEU Capacity, the largest container Vessel afloat, being handled on our dedicated super-vessel berth by 7 of our mega-cranes

Jebel Ali (Dubai) continued to grow fast in 2006 and handled more than 8.9 million TEU's, which is 17% above the 2005 level. In 2007 they reached 10,7 million TEU's.

Dubai is the largest container port between Singapore and Rotterdam.

Figure 7-28 : Dubai ports
Source: DP World

It may be of interest, also for railway development, to consider how DP World looks at Jebel Ali's success. According to Mohammed Al Muallem, Senior Vice President & Managing Director DP World, UAE region (Dubai, January 2008), the following factors are most important contributing to the success of Jebel Ali:

- Location
- Politically stable & trade friendly environment
- Investment in people, infrastructure and systems
- Vision, foresight and planning
- Benchmarking performance, productivity and quality standards
- Customer centric approach

7.5.3 Railway technology

Rail transportation is a product of the industrial era, and it represents a major improvement in land transport technology. It has obviously introduced important changes in the movement of freight and passengers. This was not necessarily because of heavy loads, since maritime transportation excelled at doing so, but because of the time element. Rail transport systems dramatically improved travel time, as well as the possibility to offer reliable schedules that could be included in the planning of economic activities such as production and distribution. The coherence of economic activities and social interactions was thus substantially improved. Rail transport has been subject to continuous innovations, technical and commercial changes. Increasing electrification and automation will also improve the efficiency of rail transportation, passenger and freight alike. New rail lines have recently been built but mainly in developed countries. Railway speed records have constantly improved (for instance the French high speed rail system-TGV). Variable wheel –base axles permit rail transport between different gauges.

Today, there are no High-speed lines in the Middle East. Turkey has lines under construction and further development is projected in Turkey, Iran and Saudi Arabia. If the projected High-Speed lines

KM OF HIGH SPEED LINES IN THE WORLD			
Country	In operation	Under construction	Planned
Turkey	0	745	1 679
Iran	0	0	475
Saudi Arabia	0	0	550
The Middle East (km)	0	745	2 704
The Middle East (%)	0 %	13 %	15 %
Total World (km)	9 476	5 897	18 430

are constructed, the Middle East may have 15% of the global High-Speed network in the future.

Figure 7-29: Middle East High Speed Lines (2008)
(Source: UIC)

The global trend involves closure of unprofitable lines and elimination of several stops. The process of rationalization (deregulation) of rail network is now completed in a number of countries: over the last 50 years, rail companies have abandoned lines (or sold them to local rail companies), removed excess terminals and warehousing capacity and sold off property.

In addition to energy efficiency (the fuel efficiency of locomotives has increased by 68% between 1980 and 2000) and lighter equipment, the usage of double-stack cars has revolutionized rail transportation with additional fuel efficiency of 40%. Double-stack rail technology is a major challenge for the rail transport system as it is effective for long distances where additional terminal costs are compensated by lower transport costs.

Whereas railway transport in some regions is experiencing a period of prosperity, there are still some challenges in many Middle East countries. However, the countries are not homogenous and there are several initiatives which include advanced and modern technology. We find examples in Iran where the plans for enhancing the railway network is impressive, in Turkey where the Marmaray mega-project is developing and the high-speed line between Ankara-Istanbul (533 km) and Ankara-Konya (212 km).

7.5.4 Infrastructure and operational conditions

Capacity constraints

Railway capacity is influenced by several variables. Static capacity, measured as the capacity that the infrastructure can handle, is commonly used. Infrastructure capacity is a necessary, however not a satisfactory, condition for smooth operation. The intention with this study is not to calculate capacity, -but state that in case of increased demand for railway traffic towards 2025, capacity problems may appear and increase for some countries.

Constraints in infrastructure are by many identified as a major limitation to economic growth. Take ports as an example. Several ports are located in the Middle East. Many of these are operating at full

capacity. Possible solutions usually involve moving non-maritime activities further inland where acreage is plentiful, and connecting this to the ports by rail (*Krumm, 2003; 165*).

Some railway-services face constraints at present.

As long as the infrastructure is not separated between passenger and freight transports, growing freight transports will influence the passenger capacity and vice-versa.

Some Middle East countries face challenges which may be considered as more important than the plain infrastructure capacity. Availability of rolling stock/traction, bureaucracy, political conditions, poor logistical systems and operational standard, as well as lack of transparency and market orientation is important elements influencing capacity and quality.

Lack of intermodale solutions and economies of scale are examples which influence capacity.

Terminal effectiveness influenced by:

1. Length of Yard tracks
 - May be necessary to split the train
2. Number of inbound and outbound tracks
 - Frequency of arrivals and departures in conjunction with cycle times.
3. Yard design
 - Where logistical elements are located and organized
4. Number of non-port trains
 - Trains which do not enter the intermodal port facilities may cause conflicts
5. Number of switch engines on-duty
6. Jurisdictional restrictions
 - Restrict the railroads ability to perform due to pre-existing agreements between carries
7. Yard limits/restricted speed
 - Speed limits within yards can be reduced in e.g. foggy conditions.
8. Remote controlled locomotives
9. Near port surge capacity potential
 - Limited storage and holding capacity near the port facilities.
10. Performance measurements
 - Identify when and where the congestion occurs.

Source: Washington Public ports association 2004

Capacity limitations are often related to the ports' inland connectors and terminal choke points. An American study identified 10 major factors of importance when evaluating a terminal's ability to handle its export and import cargo.

There are several factors influencing terminal capacity. Space conditions in general, management systems and cargo-mix are determinants of crucial importance.

Some countries in the Middle East are planning to develop their terminal systems, and some countries have more exhaustive plans than others.

Figure 7-30: Terminal effectiveness

Intermodality and logistical chains

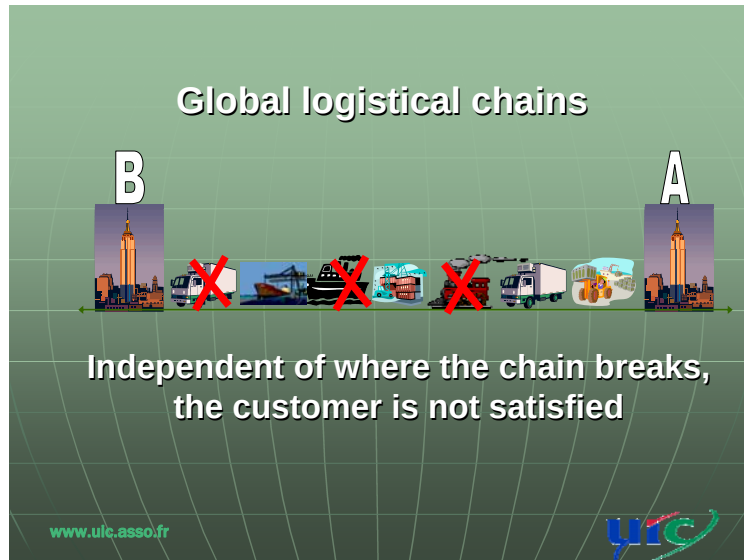
Modern transport solutions are no longer issues which concern the single modes of transport (railways, sea, truck or terminals etc.).

In recent years there has been an increased demand for intermodale transport practices that promote seamless transport by integrating different transport modes of railways, roads and maritime shipping to facilitate trade flows. A positive development for the separate modes, including the railways of the Middle East, depends on the entire supply chain and the environment surrounding this chain.

It is therefore not enough to focus on the national railways, when dealing with visions for the Middle East railways. We have to consider the different modes in the chain as well as the infrastructure and operational conditions in neighboring countries.

The world's economies are becoming increasingly interconnected. As a result, advanced logistic systems can have a significant impact on the competitiveness of enterprises and trading economies. Today's global supply chain does not focus on rail or road or ports etc; the requirement is multimodal solutions where the customers are satisfied by a door-to-door solution. This customer perspective creates a new environment for the railways.

An intermodal chain is not stronger than its weakest link. Cooperation and development of inland container terminals are important features when improving the Middle East intermodal railway systems and corridor development.



Countries in the Middle East have varying levels of intermodal infrastructure. They face differing challenges (physical and institutional) in upgrading existing or creating new infrastructure, or in promoting the use of these systems. Furthermore, countries are at different stages in devising strategies to remedy existing deficiencies and planning for future needs.

Figure 7-31: Logistical chains

Issues which impede development and the use of intermodal systems in the Middle East include inadequate existing infrastructure (like poor rail and road access to ports); poor coordination of loading and unloading activities, differing rail gauges (resulting in costly methods of moving freight from one country to another), lack of land availability in close proximity to major ports, highways and rail access routes, conflicting customs and immigration procedures, resulting in delays and prevention of freight movement from one country to another, institutional blockages of the free flow of transit vehicles and cargo in the hinterlands, and lack of coordination between different levels of government.

Effective intermodal transport operations must also be supported by investment in intermodal transport infrastructure. Positive initiatives are found in several countries, like for instance Iran and Turkey.

7.6 Other conditions

Railway transport is influenced by other conditions than mentioned above. Politics and security are among those conditions.

7.6.1 Political conditions in countries and regions

The railway industry in Middle East is strongly influenced by political conditions. Most railway companies are national monopolies and competition does only exist as competition between modes. Market correctives obtained through railway-railway competition and privatization is less widespread.

The infrastructure is owned by the governments, unlike USA, and it is believed that the Middle East will need huge infrastructure investment over several years to meet the demand for transport, energy and utilities. The same situation is found in Asia and according to Asian Development Bank (2005), this level of investment is clearly beyond the capability of the state-owned railway systems, or the public sector as a whole. ADB put focus on this situation and concludes by a question; "Where will the money come from to build these systems?"

The Middle East governments are well aware of that private sector participation, including foreign investment, is needed to meet these enormous challenges. And it is not only a matter of financing. Given the history of state ownership, there is a serious need to make the rail sector more efficient and cost-effective, through innovations and productivity gains. Governments increasingly recognize that the private sector has contributions in this respect

Trade liberalization is also considered to be an important driving force for increased railway transports in the Middle East. The matter of trade facilitation is political due to government involvement. Subsequent to the political process, it will become an economic matter, and this is a strong force of change (*Wilson, 2004*). There is no economy that has sustained fast growth that has not undertaken a significant degree of trade liberalization (*Berg and Krueger, 2003*)

Political instability has a clear impact on the demand for transportation, even though a country may be perfectly located as transit countries in intermodal logistical chains. The future political situation in many countries is not easy to predict. The economic and transportation performance may fluctuate from year to year for a number of reasons, such as displacement of population due to instability, armed conflicts, price fluctuations (see chapter 7.4), annual level of foreign investments etc.

7.6.2 Security

Security is closely related to political conditions. The term “security” covers not only issues like terrorism and armed conflicts, but also political and economical risks which may influence logistical qualities like no-thefts and no-damages. Lack of market oriented security systems is critical to the development of transportation in many countries. Other logistical criteria, like low price, will not compensate for insufficient security standards.

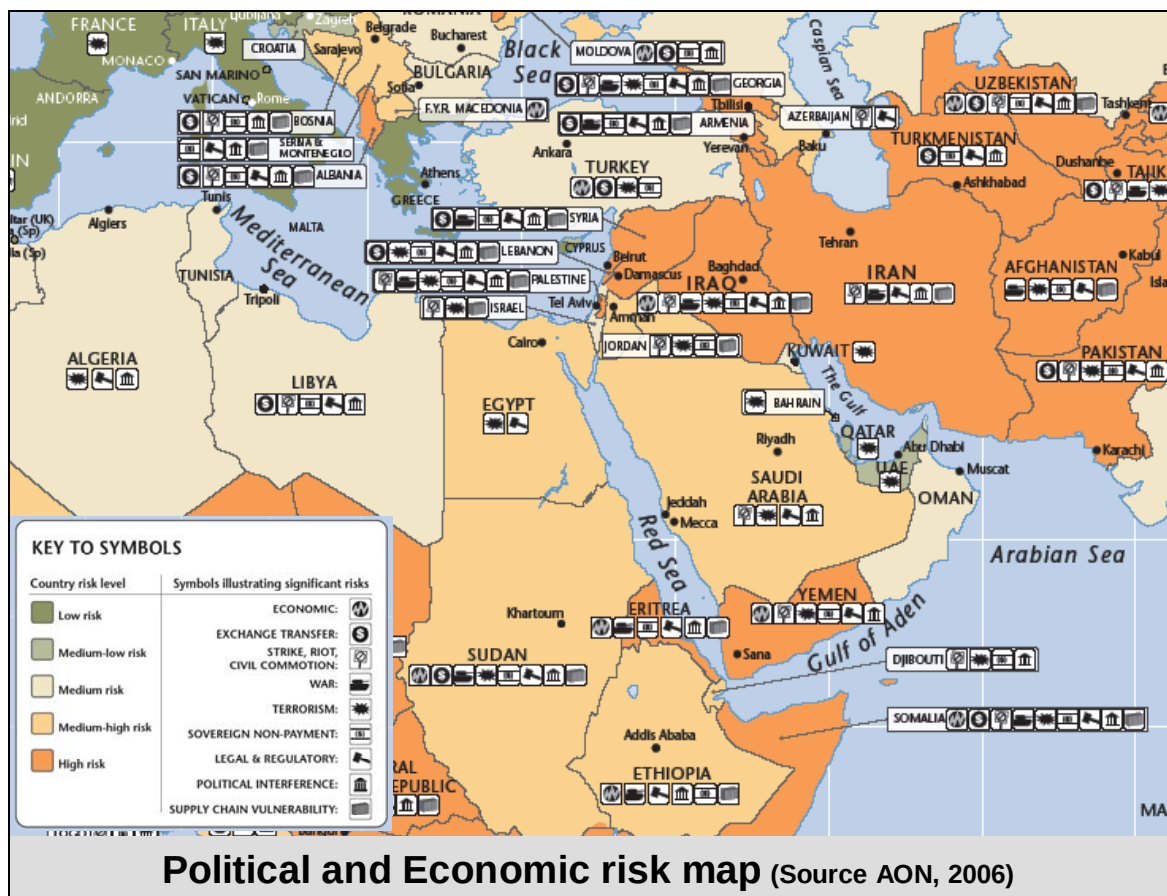


Figure 7-32: AON, Political & economic risk map, 2006

The Middle East countries may develop to be important markets for export and import, and many countries are influenced by the external evaluations of their risks. It is not a satisfactory condition

that a government representative states that the risk in his country is low. Transportation, the choice of routes and markets are influenced by “outside” markets players’ perception.

Terrorism risk as well as political and economical risk exist several places in Middle East. The map below is produced by AON (2006) and it shows **political and economical risk**, not terrorism risk. By using colors AON indicate where the risk is low, medium or high. “Green”, which is AON’s indication of “low risk” is not found in any Middle East country. When developing international transport corridors through countries where the external market evaluates the risk as “high”, the risk issues should be a central part of any international transport vision.

AON has also made a separate map where disruption of global supply chains may be influenced by various risk components. These evaluations, right or wrong, influence transportation in general and also railway transportation.

The map below (Figure 7-33) shows sections of the global supply chain where there have been recent problems or where there is a threat connected to such incidents. As for the Middle East region the map shows recent incidents like the terrorist attack in the “Gulf of Aden”, the tanker breakdown which blocked the Suez canal and the situation in Iraq. Furthermore it indicates disruption threats (or severe consequences) if something happen in the Strait of Istanbul or the Suez Canal.

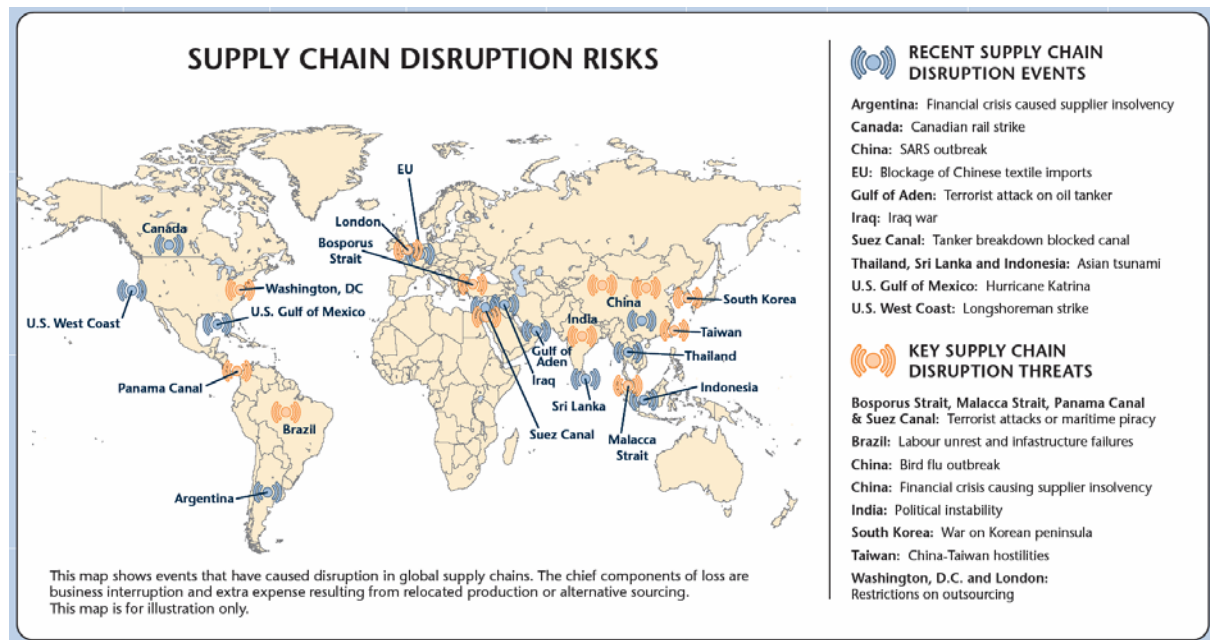


Figure 7-33: Supply Chain Disruption Risk (AON, 2006)

8 The railways of Middle East – short description

This chapter includes a historical introduction to the Middle East railways and an overview of the railway system, network density, projects, corridors and production. The last sub-chapter is an overview of the new dimension of UIC and UIC's role in the Middle East.

8.1 Historical introduction

8.1.1 **Regional history**

Turkey, Iraq and Iran did take initial steps to construct national railway lines at the end of the 1800s.

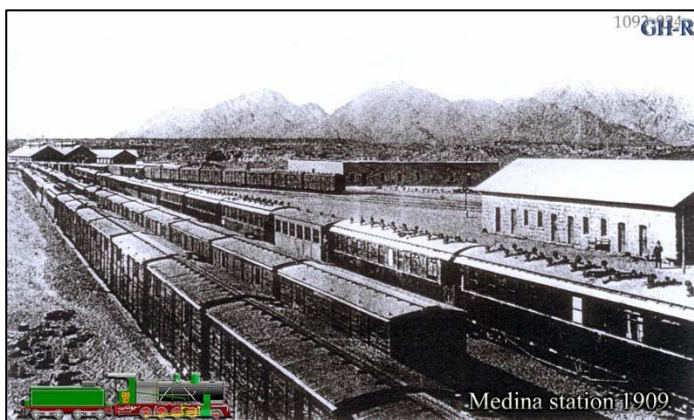


Figure 8-1: Medina station, 1909

But the first major – and most important - railway construction in the Middle East region was the Hedjaz Railway in the then Ottoman empire, linking Damascus in Syria with Medina in Saudi Arabia, via Amman in Jordan. This line was – to a great extent – financed by Moslems for pilgrim travellers, and constructed in the early 1900s. Much of this ancient railway has now been abandoned.

The construction of the Hedjaz Railway which was connected to Hedjaz from the Baghdad Railways, linking Germany across Istanbul to the Persian Gulf, commenced on 1. September 1900. The construction of the 1 464 km link was completed on 1. September 1908. The length of the Hedjaz Railway, including side lines, was 2 241 km. Despite this short lifespan, the Hedjaz Railway achieved important military, economic and social results. The transportation of 232 563 passenger and 112 thousand tons of freight on this line in 1913 is an indication of the importance. In the recent years the attempts to revive the Hedjaz Railways has been brought to the agenda during the meetings between the governments in the countries connected to this route.

The railway history of the Middle East is mainly also a history of the colonial powers' strategic and economical priorities. During the first part of the 1900s, railways were built for military purposes, as well as to provide distribution routes for products from the industries of the colonizing nations and raw materials for the same industries. Consequently, the lines have different technical specifications, depending on which country constructed them.

During the last century, railway construction was proceeding at a considerable speed – mainly in Turkey, Syria, Iran, Iraq and Israel. However, the rail density was – and still is – low, compared with more advanced countries. Likewise, the diversity of standards and axle load did make through traffic difficult. Still, a few border crossing were established within the region and towards Europe and Asia.

8.1.2 **The Arab Union of Railways**

In 1979, the Arab Union of Railways was established as a result of a meeting in Amman, Jordan, by representatives from some Arab railway organizations, in order to enhance the development of relations between neighbouring rail networks, to establish international cooperation between railway organizations and to obtain an increased share of the transport volumes. The Union also have been

organizing conferences, training courses and studies, have unified railway terms and publishes a railway quarterly named "Arab Railways". Most Arab railways did become members of this Union, which is based in Aleppo, Syria, and have been working diligently towards these goals.

8.1.3 The Conference of Middle East Railways (CMO)

CMO consists of members from TCDD, IRR, RAI, CFS, CFH, HJR and OCFTC. It was established in 1956 to cooperate and to discuss the proposals to improve the transportation in the region. CMO assembles once a year.

8.1.4 Establishing the Arab Mashreq International Rail Network

In 2003, an UN-supported agreement on establishing an international rail network within the Arab sphere, was launched. The main objective was to agree on railway corridor/axis north-south and east-west in the region. This agreement was to be open for signatures by members of the Economic and Social Commission for Western Asia, ESCWA (See chapter 9.3.2).

8.1.5 UIC regional organization

See chapter 8.1.5

8.2 Railway map

The map shows existing railway lines and some of the projects in the region. The map is not complete when it comes to projects.



Figure 8-2: The railways of the Middle East

8.3 Overview

Close to 60% (8) of the countries (Middle East definition, see enclosure I) has a railway infrastructure. The total route length of all 8 railway networks in the Middle East region is estimated to 22.739 km (as per August 2007, based on figures from the railways, UIC and various other sources).

The railways standard is quite heterogeneous and the majority of the countries have less than 2.000 km of railway network. Approximately 71% (16.056 km) of the network is located in Turkey (8.697 km) and Iran (7.359 km¹⁷). Syria has the third largest network (2.043 km).

The 8 countries, and the total length of their route network, are shown in the figure below.

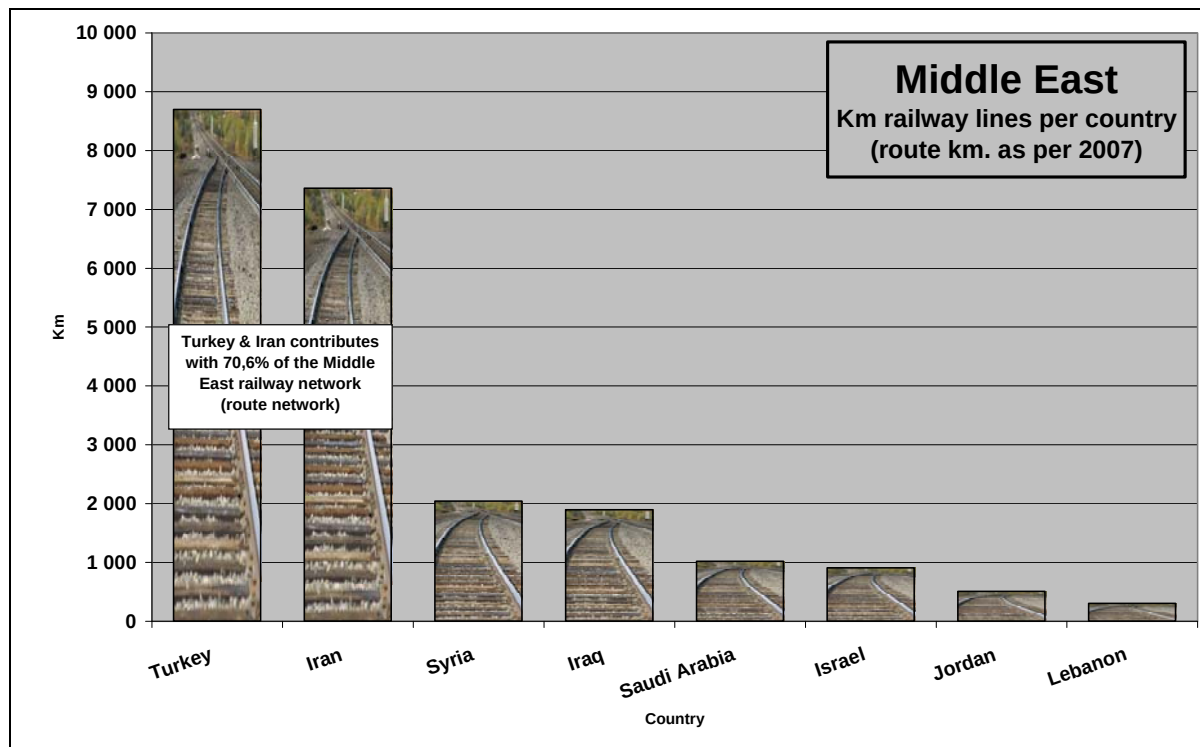


Figure 8-3: Middle East railway network, route km per country

In some of the countries, conflicts and war has damaged the network and several kilometers are abandoned (e.g. Lebanon). Only 10% of the Middle East network is believed to be electrified.

¹⁷ According to Iranian Authorities (Iran Transit Forum, July 15-2007, Teheran) Iran has 3.051 km railway tracks under construction and feasibility studies are ongoing for additional 13.348 km.

8.3.1 Density of railway network

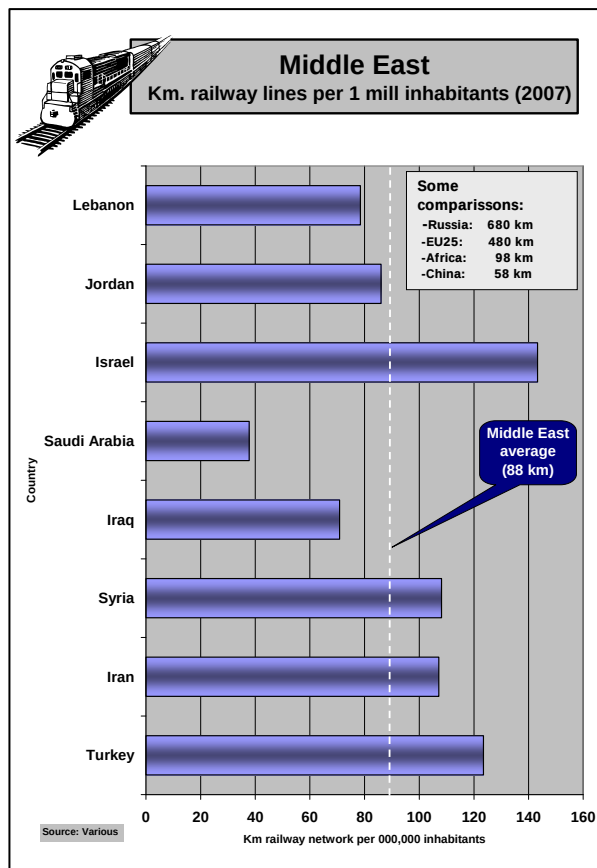
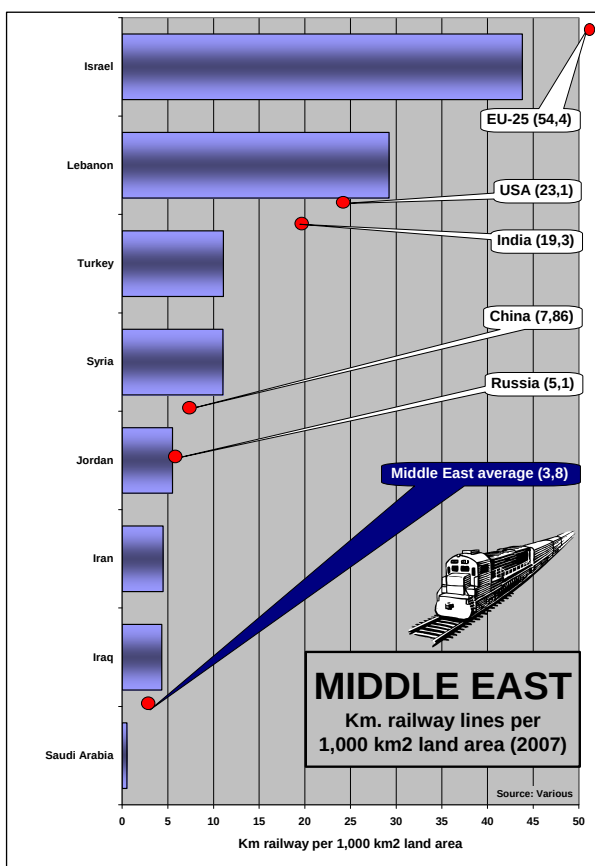


Figure 8-4 shows the railway network (route km) per 1 million inhabitants (8 countries where the railway network is in operation). The density in Lebanon is based on the latest official data; however it is known that major part of the network has been damaged during conflicts.

The network density (measured per capita) varies from 40 km to 140 km per 1 million inhabitants. Heavily populated countries like Iran and Turkey do also have relatively high density per capita. Israel, with only 6.4 million inhabitants, ranks on top of the list by 143 km route-kilometer per 1 million inhabitants. Saudi Arabia has the lowest density; less than 40 km per 1 million inhabitants.

The density in some other countries and EU25 is shown in the figure as a comparison.

Figure 8-4: Density of railway network (route km per 1 mill inhabitants)



Area density

Figure 8-5 shows the railway network (route km) per 1 000 km² land area. The density in Lebanon is based on the assumptions above (ref. figure 8-4).

The network density (measured per km²) varies from 0,5 km (Saudi Arabia) to 44 km (Israel) per km². Small countries (measured by area) like Israel have a relatively high density. Turkey and Iran have the largest railway network measured by kilometers. Per km², Iran (4,5) can internationally be compared with Russia (5,1) and China (7,8). Turkey (11) has a density in the interval between China and India (19.3).

The area density in some other countries and EU25 is shown in the figure as a comparison.

Figure 8-5: Density of railway network (route km per 1000 km² land area)

8.4 Middle East railway gauge

The world railway network, according to World Fact Book, is estimated to 1 115 205 km (mostly 2005 updates). Based on this source, the Middle East¹⁸ network is 2.1% of the world total:

The Middle East share of the world railway network is:

- 0% of broad gauge (more than 1435 m.m.)
- 0,4% of narrow gauge (less than 1435 m.m.)
- 3,2% of standard gauge (1435 m.m.)

Compared with the EU, the Middle East railway network (route km) is approximately 1/10 of the European network. The Middle East railways have 2 different gauges, whereof the overall share (96%) is standard gauge/1.435 mm. Jordan has a small network of 1.050 mm (estimated to be 508 km in 2004). Iran has also a few kilometers (94 km) of 1.676 m.m. railways (to Pakistan) and there is a 1.050 mm line (136 km) in Syria between Damascus and Jordan (Dera), connected to the railways in Jordan.

Country	Main gauge (m.m.)
Turkey	1 435
Iran	1 435
Syria	1 435
Iraq	1 435
Saudi Arabia	1 435
Israel	1 435
Jordan	1 050
Lebanon	1 435

Table 8-1 shows the dominant gauge in the respective countries. Gauge changes represent discontinuity in national and international logistical chains, where the operational costs only can be eliminated by building new tracks and reduced by various technical devices, transloading techniques and improved logistical operations. See also chapter 9.2 for an overview of missing links, discontinuity and operations related to gauge break.

Table 8-1: Middle East railway gauges

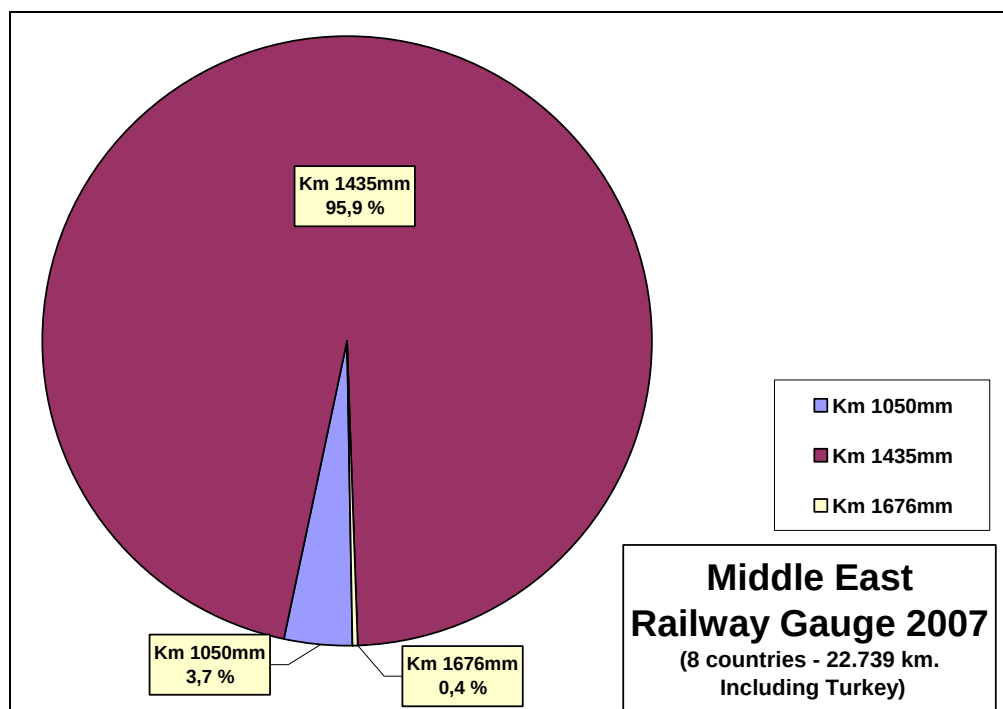


Figure 8-6: Middle East railway gauges, share 2007

Figure 8-7 (map) is an illustration of the different railway gauges in Middle East as per 2007 and figure 8-6 shows the share of the various gauges (total km and %).

¹⁸ List of countries, see enclosure I

The figures illustrate that there are almost no gauge variations in the Middle East region. This is a favorable situation compared with many other regions of the world. Extensions and connections between many countries are also easier, since the traditional gauge discussion is avoided. However, neighboring countries in the north and east have different gauges which create a potential lack of international interoperability. This situation requires more effective operational procedures compared with a situation where the gauges are standardized.

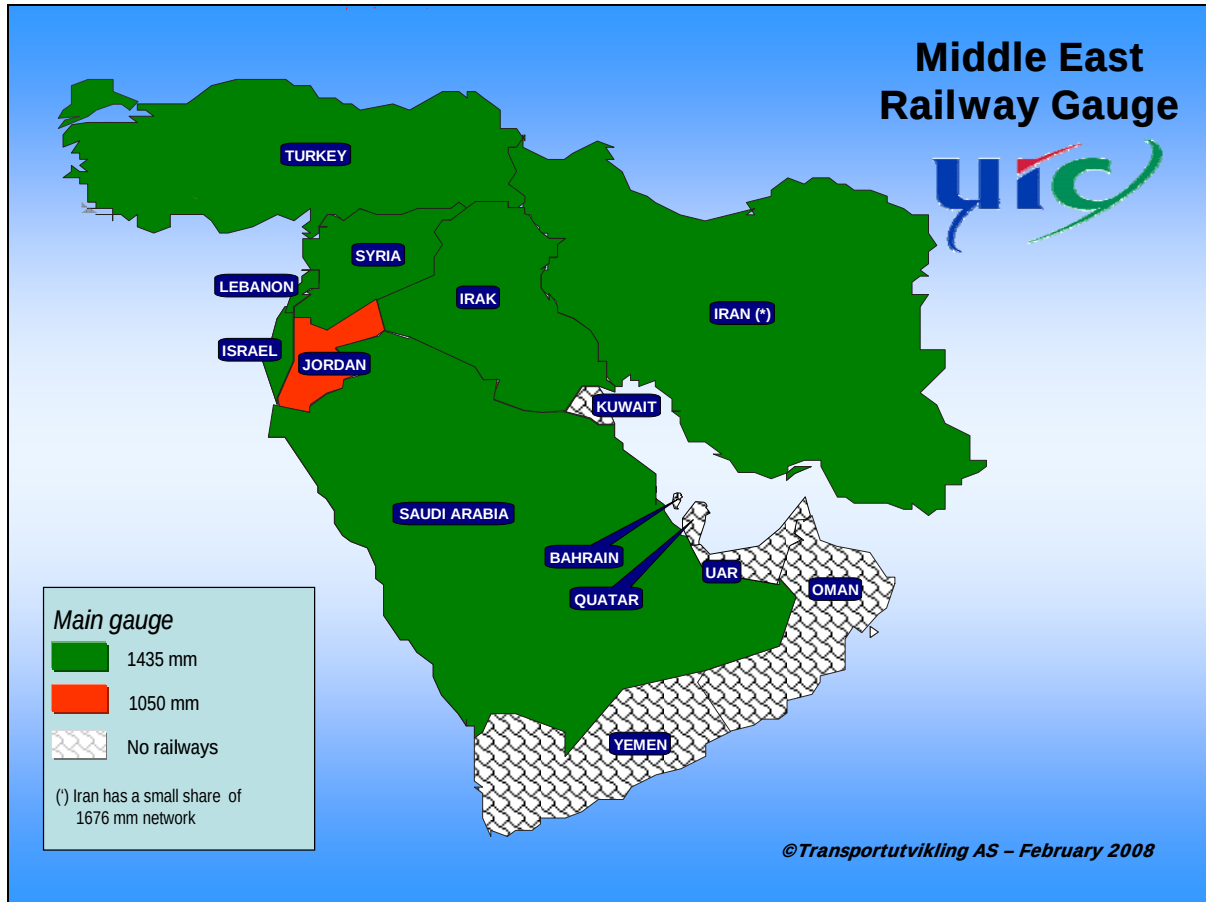


Figure 8-7: Middle East Railway Gauge, 2007

8.5 Production

The railway transportation work is measured by:

- Passenger-kilometers (pax-km), which is an indication of passenger transportation work based on the number of passenger transported and their average travel length measured in kilometers.
- Ton-kilometers (ton-km), which is an indication of net freight transportation work based on the net tons carried and average freight haul distances measured in kilometers.

The production data are of different quality. For some countries, accurate information is not available. However, the information from the Middle East countries is better than many other regions of the world. The main sources for the information are UIC, the World Bank, the Railway Directory, national statistics and information from the separate railways and organizations.

The data sets used are from the period 1980-2005. For some countries 2006 figures are available.

8.5.1 Passenger transport

More than 85% of the total passenger transportation work is produced in Iran and Turkey. Turkey has been stable/slightly reducing during the entire period, while Iran has been growing fast since 1999 and surpassed Turkey around 1999/2000. From 1990 to 2005, Iran's passenger-km grew by 144% while Turkey declined by 21%.

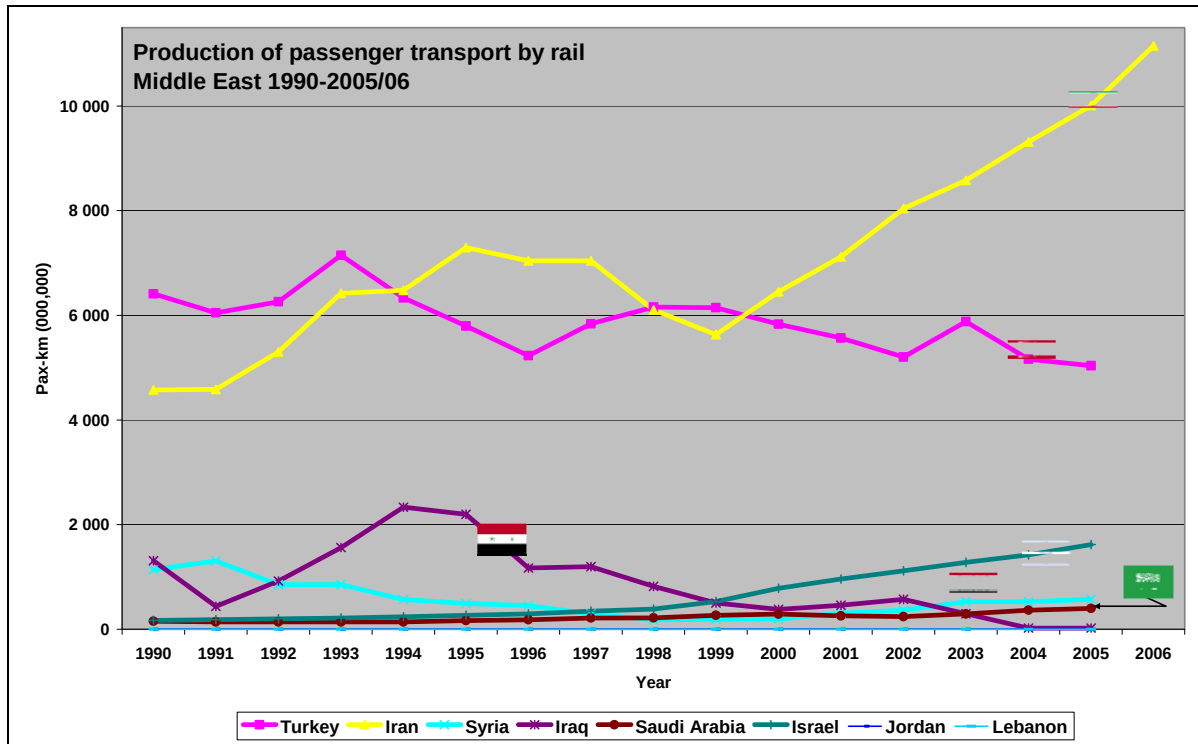


Figure 8-8: Passenger-km by rail 1990-2005/06

The remaining countries are small producers of passenger transport. Israel and Saudi Arabia have shown growth from 1990 while Syria has declined in the same period. Iraq's passenger transport is strongly influenced by the present situation in the country. Lebanon and Jordan are small producers. The railway system in Lebanon became unusable because of damage done during the civil war in the 1980s and in 2006. The Hedjaz railways in Jordan operate on a small scale basis between Amman and Damascus.

In 2005 approximately 17.700 million passenger kilometers was produced by the 8 railway countries of the Middle East. Internationally, these volumes are small. As a comparison, large producers like India and China had approximately 600.000 million passenger-km each in 2005.

Middle East: Passenger-km by rail 2005

Country	Mill.km	Share	Acc.share
Iran	10 012	57 %	57 %
Turkey	5 036	29 %	85 %
Israel	1 617	9 %	94 %
Syria	571	3 %	98 %
Saudi Arabia	399	2 %	100 %
Iraq	24	0 %	100 %
Jordan	2	0 %	100 %
Lebanon	0	0 %	100 %
Total	17 661	100 %	

As mentioned, two countries are dominating the picture. All countries are shown in the table (left).

6 of the 8 countries are active UIC members as per January 2008 (shown in boldface and yellow color). One country (Jordan) is associated member.

Table 8-2: Middle East passenger-km by rail (2005)

In 2006, Iran's production amounted to 11.149 million pax-km (+11% compared with 2005).

8.5.2 Freight transport

Close to 83% of the total freight transportation work (ton-km 2005) in the Middle East was produced in Iran and Turkey (see figure below). In terms of freight traffic, the Middle East railways are small. As for passenger transports, - Iran is dominating the Middle East freight railway picture. In 2005, 56% of the Middle East passenger kilometers originated in Iran. Turkey has been relatively stable during the entire period, -however, a decreasing share due to growth in Iran. Iran has been growing fast since early 90ties, when they also surpassed Turkey. From 1990 to 2005, the Iranian ton-kilometers grew at the same rate as passenger-kilometers, by more than 140%

The remaining countries are small producers of freight transport. Israel and Saudi Arabia have shown relatively stable development. Syria and Saudi Arabia has been growing fast during the last years. Iraq's freight transports, as for passenger transports, are strongly influenced by the country's internal situation. In Jordan, some minor freight transports (phosphate) are carried out by the Aqaba Railway Corporation (ARC)

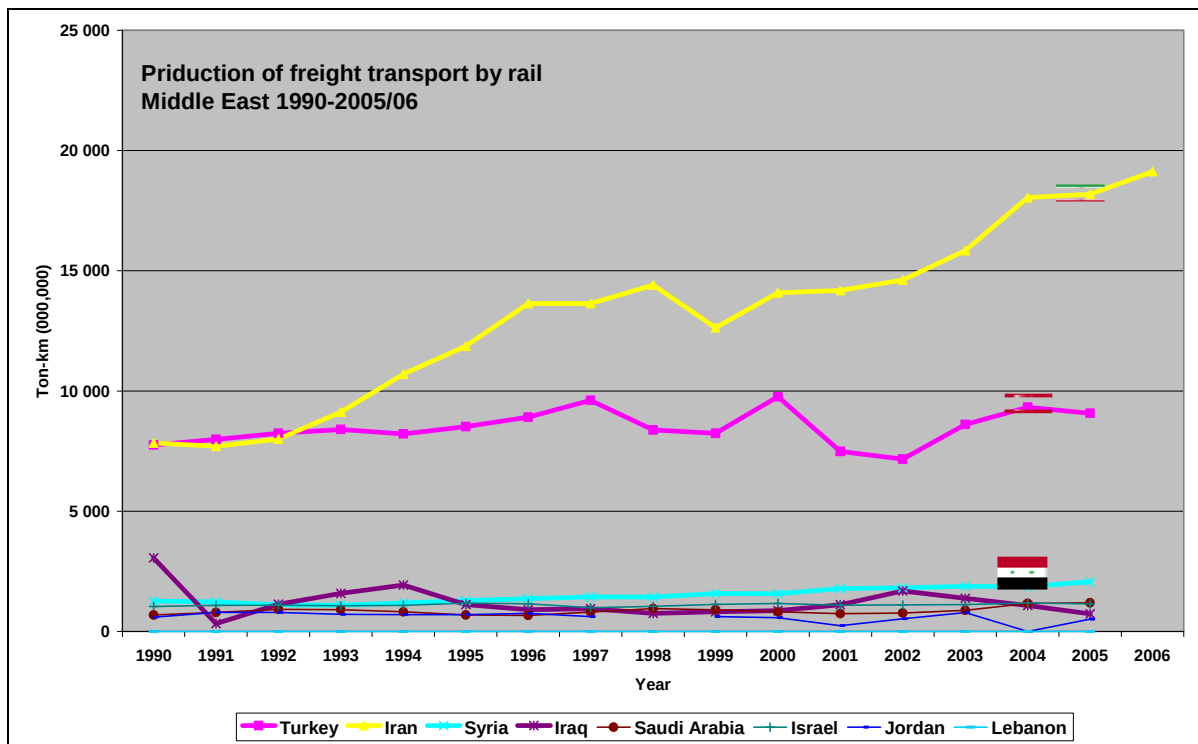


Figure 8-9: Ton-km by rail 1990-2005/06

In 2005 approximately 33.000 million ton kilometers was produced by the railway countries of the Middle East. Internationally, these volumes are small. As a comparison large producers like Russia and China have approximately 2.000.000 million ton-km each in 2005.

Middle East: Ton-km by rail 2005

Country	Mill.km	Share	Acc.share
Iran	18 182	55 %	55 %
Turkey	9 077	28 %	83 %
Syria	2 074	6 %	89 %
Saudi Arabia	1 192	4 %	93 %
Israel	1 149	3 %	96 %
Iraq	733	2 %	98 %
Jordan	518	2 %	100 %
Lebanon	0	0 %	100 %
Total	32 925	100 %	

As for passenger transports, two countries are dominating the picture. All countries are shown in the table (left).

Table 8-3: Middle East ton-km by rail (2005)

Iran grew by 5% from 2005 to 2006 (to 19.127 million ton km).

8.6 UIC and Middle East

The new dimension of UIC

UIC is an international organization with members all over the world. UIC's strategic focus is the global level as well as to develop specific actions on the regional level, due to the recognition of the regional railways importance and that they are the crucial "building-blocks" of the global railway community.

The different regions of the world and the railways are on different development levels and they have different challenges and opportunities. It is therefore an important objective to develop targeted visions and strategies for the different regions of the world. These strategies may have different focus, depending on regional characteristics and priorities.

UIC's ambitions are to identify relevant visions and develop procedures for the implementation of these visions for all "UIC-regions" of the world, including the Middle East.

Figure 8-10 shows the "UIC regions" as per 2008. Each region of the world is represented by a regional assembly.

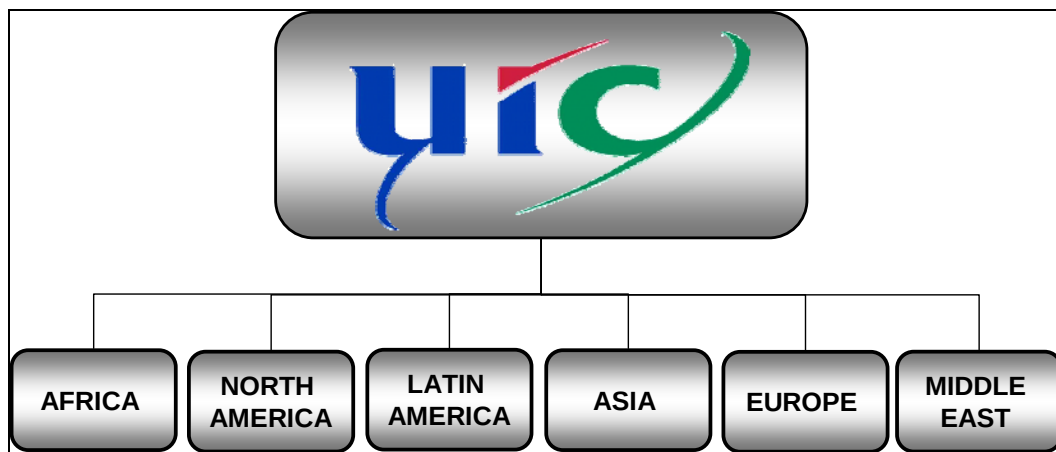


Figure 8-10 UIC's regional organization, 2007

UIC's Regional Assembly of the Middle East is established and internal regulations were approved in Isfahan on May 29-2007. The development of organizational issues, like setting up a regional unit through RAI/Teheran, is in process.

UIC member status in the Middle East

The International Union of Railways intends to put a stronger focus on the Middle East and the development of the Middle East railways.

8 countries have operational railways, -even though the railways in Lebanon are more or less damaged and the railway in Iraq is challenged by the conflict situation in the country. Six (75% of the market for members) of these countries are active members. Jordan is an associated member of UIC. The active UIC members represent 97% of the total railway network in the Middle East countries.

The map (next page) shows UIC members and associate members as per August 2007. Active UIC members are shown in green, yellow is associated members and white color indicates that there are no membership relations. Countries with no railways are shown in red.

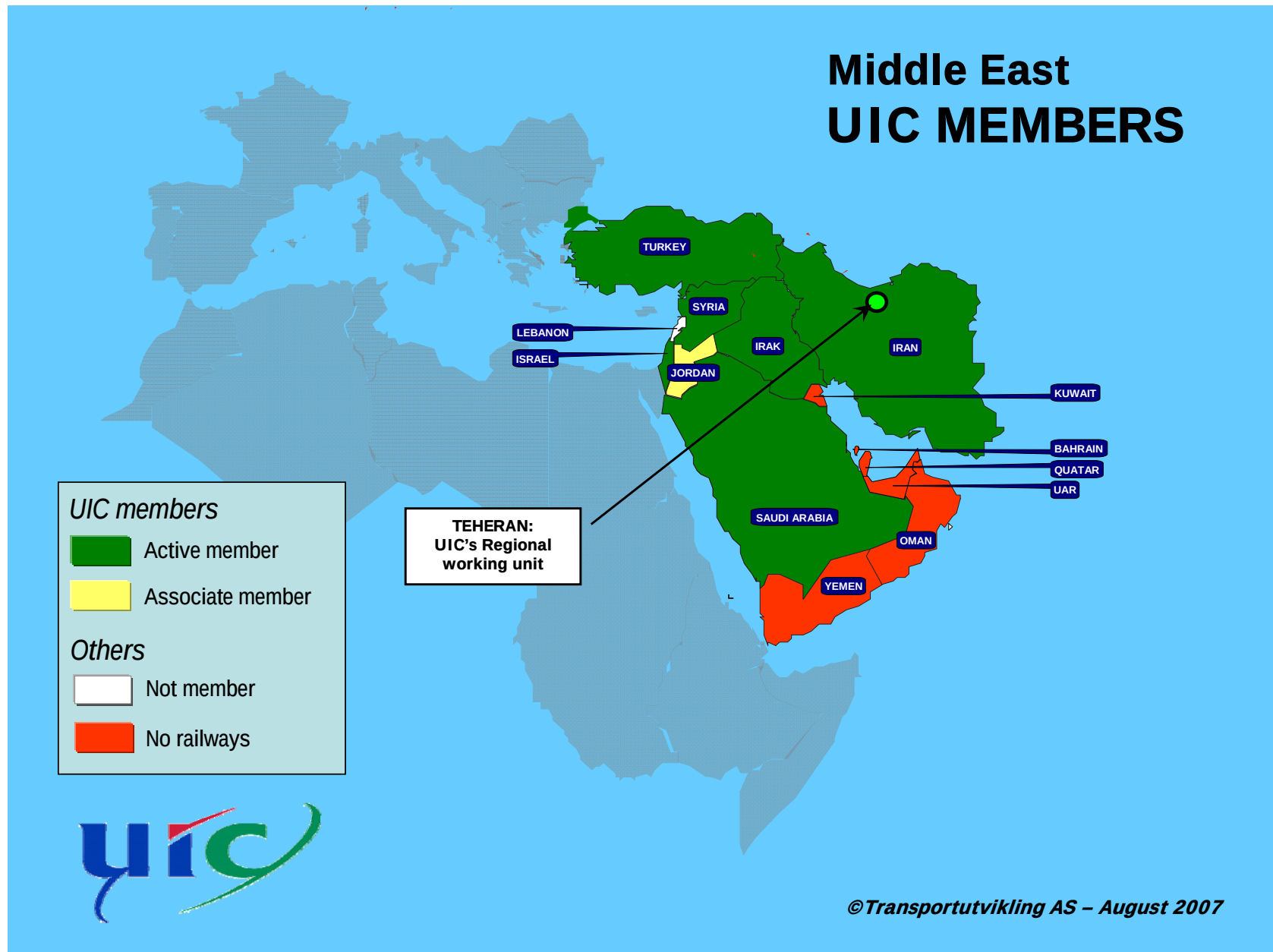


Figure 8-11: UIC members, Middle East

9 Projects & international corridors

Intercontinental transport corridors are important international, as well as national, features. Such corridors are of particular interest in the Middle East, particularly due to the region's location between Asia and Europe. Transport corridors are also of importance when connecting the Middle East regions (Intra-Middle East) and stimulating transit operations through the Middle East continent.

The countries in the region have several national or bilateral plans and projects. Many of these projects may be of importance for the development of the region's internal economy and transportation system and they can be considered as links in international corridors. Iran has per July 2007, 3,051 km. of tracks under construction and studies for additional 13,348 km.

The emphasis in this document is put on the international/intercontinental level.

9.1 Corridors in general

The purpose with this document is not to be detailed or launch plans for approval. The purpose is to make background information for UIC's work in the Middle East and the visions of the Middle East railways.

Visions for transport corridors can be based on various criteria. Development corridors are often based on business spin-offs from the transportation work while the market perspective may be less emphasized. On a long term basis, the market perspective can not be excluded, if the corridor is going to be commercial viable.

When the market perspective is the main focus, it is possible to develop visions based on the flow structures by looking at the entire Middle East as a region with international potential as well as regional opportunities.

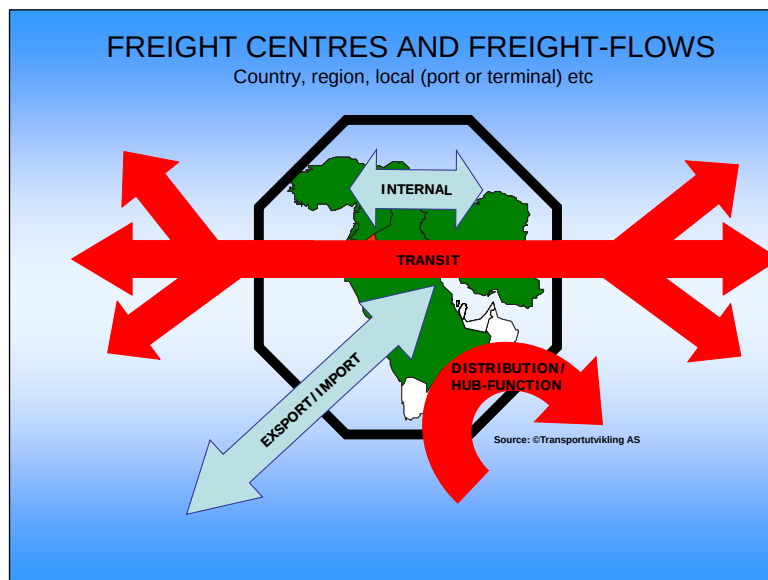


Figure 9-1 shows potential transportation flows which should be taken into consideration when developing corridors and transportation structures. The transportation flows¹⁹ are separated into:

- Internal
- Export/import
- Distribution/hub-functions
- Transit

Figure 9-1: Potential trade flows

Internal transports should be developed as a part of an Intra-Middle East strategy and for the main purpose of integrating the Middle East continent. Important corridors may be connections between major cities, production areas to consumption areas, light trains for populated regions, regional passenger/tourist trains etc. Main challenges in the Middle East region are missing links, regulations, conflicts etc

¹⁹ The map focuses on the Middle East as a region (black border). The arrows are not meant to indicate any country specific priorities. It is a general visualization. A transit flow (for example) can of course take place in all countries and directions, not only East-West crossing the middle of region.

Export/import corridors are the dominating corridors in today's Middle East. They are important and could be further developed logistically as well as administrative. These corridors are important intermodale connections for the Middle East industry and population, and challenges are related to effective logistical operation and business climate.

Distribution/hub-functions can be considered as separate activities. Maritime ports are often organized based on transshipment/distribution functions and in the Middle East there are several examples in the Mediterranean, Red Sea and Gulf/Indian Ocean. The same principles can be used for inland terminals and hubs. Challenges are for instance effective hub-functions, logistical networks and distribution functions

Transit corridors are corridors crossing the region or parts of the region. Such corridors in the Middle East are in some areas hampered by lack of infrastructure, maritime competition and to some extent the perception of high risk in some countries. However, there is a transit potential, which also depends on the shipping lines' strategies and future rotations. It is also important to note that transit creates more activity than only the isolated through transport. Due to discontinuous points (ports, terminals, gauge breaks, markets etc) transit creates new port-hinterland connections and inland routes in both directions as well as synergies with other routes and modes. Transit corridors can truly be development corridors for the future, when logistical operation and commercial conditions are accepted by the market players.

It is also possible to reduce temporary challenges by various political actions which can stimulate transit, - like Iran's and Turkmenistan's subsidizing of fuel.

9.2 Missing links and cross border issues

Completing missing links, which also includes opening of closed borders, are critical success factors when developing continuous railways transports. It is a necessary condition; -however not satisfactory since many railway corridors are challenged by operational issues and political frameworks.

The Middle East represents more than 4.1% of the world land area and is constituted of 14 countries (UIC definition). 8 countries have some kind of railway infrastructure in operation.

The Middle East has no continuous railway infrastructure which can be accommodated into carrying freight or passengers across the entire continent, east-west or north-south. Many regional links are often missing. If they exist, some are deteriorated, outdated or closed due to political reasons.

Six countries have no railway infrastructure, all located along the coast lines (Yemen, Oman, UAE, Qatar, Bahrain and Kuwait). There are plans in UAE and the Dubai Metro, an ambitious overhead light railway, due to be completed in 2009, will reduce road congestion by carrying an expected 1.2 million passengers a day.

Saudi Arabia has no railway connection to neighboring countries. The railway system connects Riyadh and the Persian Gulf. Projects and ideas exist for various connections like south to UAE, Yemen and Oman, and north to Kuwait, Iraq, Israel and Jordan. On a short-medium term perspective, national projects like the North-South corridor²⁰ and the Saudi Land Bridge (Dammam – Jeddah) will have the strongest priority in Saudi Arabia.

Conclusions missing links Saudi Arabia:

- All neighbouring countries

²⁰ An internal North-South Corridor in Saudi Arabia. Not to be confused with the INSTC (See chapter 9.4).

In theory **Iraq** has a relatively extensive railway network, consisting of northern links to Syria, and further to Turkey/Europe and Central Asia. However, a major part of the network is damaged and deteriorated due to war and conflicts. The turbulent situation may be a more serious long-term obstacle than damaged infrastructure.

Conclusions missing links Iraq:

- Iran- one link under construction (Khorramshahr-Basra) and a second link planned (Kermanshah-Diyala)
- Kuwait - no railways
- Saudi Arabia – no connection
- Jordan – not completed and break of gauge

Iran has railway connection to the north, to Turkey and the Central Asian countries of Azerbaijan and Turkmenistan. There is currently no eastbound connection to Pakistan. The Ministry of Roads and Transportation in Iran states that Iran's railway network will be linked up with Pakistan's within short, with the completion of the Kerman-Bam-Zahedan railroad project. By linking Iran's railway to Quetta, Pakistan will be connected to the Central Asian countries and Turkey. Furthermore, prospects for railway lines to the Afghanistan border exist. Afghanistan is in an interesting position, because it is at the crossroads of Asia and is virtually without railways. Should it be decided to build any, the choice of gauge will be challenging by it being surrounded by three different gauges. Iran to the west uses standard gauge, as does China to the east (surrounded by broad gauge in Russia and Kazakhstan); to the south, Pakistan uses 1676 mm gauge, while to the north, the other central Asian republics of Turkmenistan, Uzbekistan, and Tajikistan use 1520 mm gauge. Furthermore, the Iranian northern connections, by using maritime transports crossing the Caspian Sea, give interesting opportunities if the intermodal solution are well developed (Eg. The International North-South Transport Corridor, INSTC).

There is no railway connection between Iran and Iraq. Plans exist for the construction of a rail link between Basra (Iraq) and Khorramshahr (Iran). Furthermore there are plans for a direct link between Tehran and Baghdad, and RAI is already building a line from Arak west to Kermanshah. Studies for an extension from there to Khosravi on the Iraqi border are completed.

Conclusions missing links Iran:

- Afghanistan – no railways (planned, see chapter 9.3.4)
- Azerbaijan – through Armenia, break-of-gauge 1435mm/1520mm
- Iraq - under construction (See Iraq)
- Pakistan - missing link Kerman-Bam-Zahedan is under construction, and break-of-gauge 1435mm/1676mm.
- Turkmenistan - break-of-gauge 1435mm/1524mm

Turkey has a strategic location as the historic crossroad between Asia and Europe. Turkey has potential railway connections in almost all directions, -to Europe via the Strait of Istanbul, -to Russia via neighboring countries²¹ and by using sea transports crossing the Black Sea. To the south, Turkey has connections to Iran and Iraq, as well as Mediterranean Sea transports. There is no railway direct link between Georgia and Turkey, but a 1 435 mm railway line between Kars, Tbilisi and Baku is under construction. The Marmaray project is the main project in Turkey of Europe-Asian interest. Seamless transportation between Turkey-Bulgaria/Europe will be provided through the completion of this project.

Conclusions missing links Turkey:

- Georgia- no connection (missing link) and break-of-gauge 1435mm/1524mm
- Armenia – break of gauge 1435mm/1524mm (however, border closed since 1993)

²¹ Russia has imposed a trade embargo with Georgia since 2006 and the border between the two countries is closed. Furthermore, the railway network in Abkhazia (region in Georgia close to the Russian border) needs to be restored and has been shut down since the 1992-93 separatist conflicts.

- Bulgaria/Europe-Istanbul strait tunnel

Syria has, technically, railway connections to all neighboring countries, except Israel (and Lebanon). Iraq can be reached through Rabeiyh/Yaaroubia, Jordan through the Hijaz railway (1050 mm) and Turkey through at Qamishli/Nusaybin.

The Syrian railways are planning for transports from European countries to Syrian ports, then through Syria, Iraq and Iran to the middle and East Asia (IEWC). The next step is connections from Europe through Turkey and Syria to Jordan and the Arab countries.

Conclusions missing links Syria:

- Lebanon - defunct
- Israel - defunct

Lebanon has (theoretically) a railway connection to Syria (north). The Railway system is unusable due to damage suffered during the Lebanese Civil War. However, some sections are operable and according to journalistic sources (November 21st, 2006) Lebanon is finalizing a plan with the Syrian Railway Authority to reconstruct the railroad line linking the Port of Tripoli to the northern border crossing at Abboudieh. Reactivating the northern track is part of a stalled 2002 bilateral agreement to resurrect the entire Lebanese-Syrian railroad grid - consisting of a north-south axis beginning at the Port of Lattakia and terminating at Tyre via Beirut, and an East-West axis from Damascus to Beirut. The plan is a step toward the creation of a 19,528-kilometer railway network covering most of the Middle East.

Conclusions missing links Lebanon:

- In reality all neighbouring countries are missing

Jordan has a railway connection to the north (Syria), where there is a 1050 mm line to the Damascus region (Hijaz railway). The connection to Saudi Arabia has been defunct since 1917 and a connection to Israel has been discussed, by constructing a standard gauge line from Irbid (Jordan) to Bet Shean. Since all of Jordan's neighbours primarily use standard gauge, any linkup would most likely see the conversion of Jordan's remaining narrow gauge lines.

Conclusions' missing links Jordan:

- Syria - only to Damascus, then break of gauge 1050/1435
- Saudi Arabia - no.
- Israel - no.
- Egypt – no, requires bridge over Gulf of Aqaba
- Palestine - no
- Iraq - no

Missing links are obvious challenges when it comes to the development of railway transports. A transport through a missing link can only be organized as a multimodal transport where at least two trans-loadings are required. The trans-loading operation is often costly and time consuming. For many countries this operation also involves higher level of risk, since the potential risk level is higher when freight is not moving. Figure 9-2 is a simplified illustration of the geographical area in Middle East where no international (and bilateral) railway connections do exist. These missing links are effective barriers for continuous intra-Middle East railway transports as well as a challenge in international transit corridors.

However, construction of railway infrastructure is only a necessary, not a satisfactory, condition for the development of competitive railway corridors and routes. The physical missing links are only part of the challenges since the operational systems have to improve when getting the full effect out of

infrastructure investments. If the operational system is not functioning, quality is low or the commercial conditions are not accepted by the market, -the return on investments will be low.

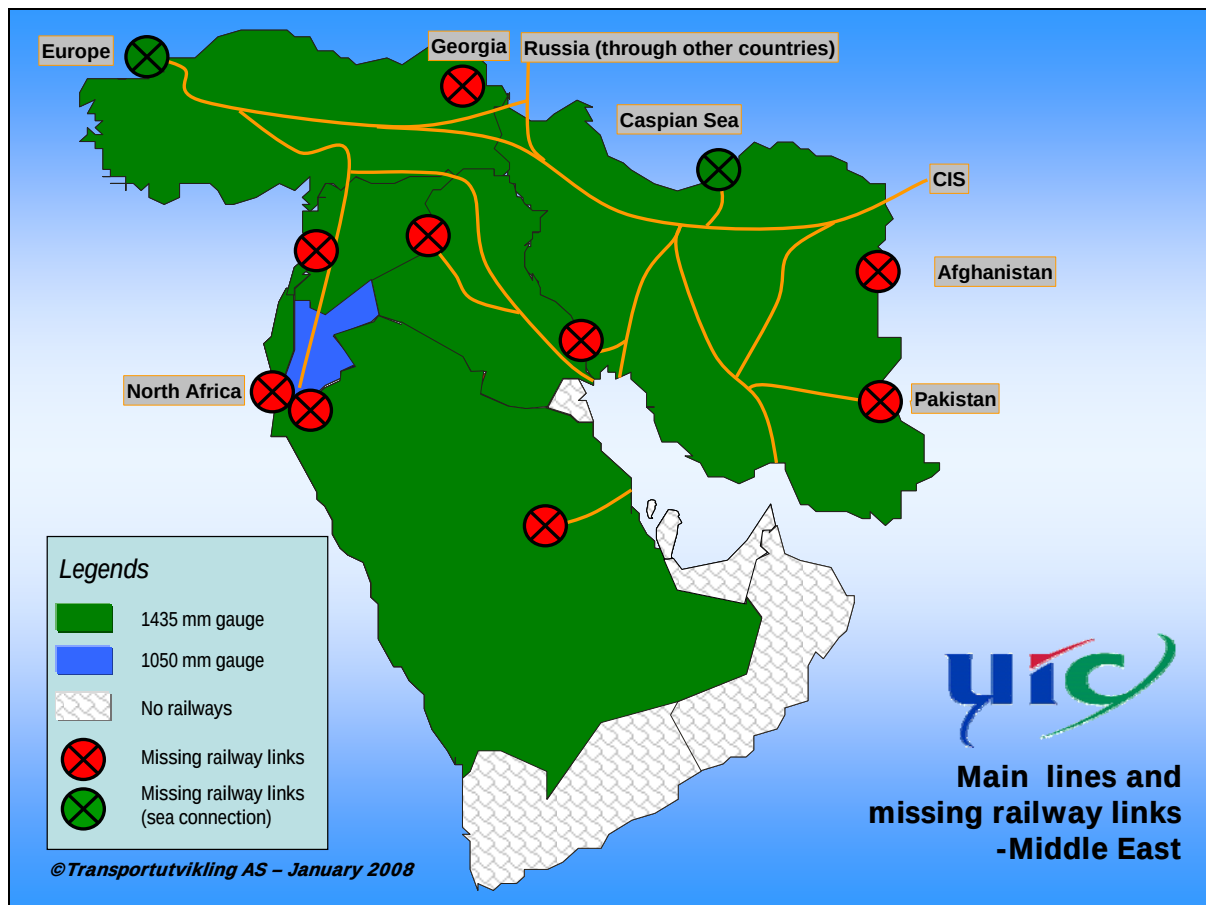


Figure 9-2: Lack of intra-Middle East railway connections

Regulations, infrastructure, rolling stock and procedures in the Middle East are not generally homogenous, -all contributing to more complex border crossings in regions where the infrastructure exists. This discontinuity has severe impact on effective logistical chains, -time consumption as well as costs.

Gauge

The most “promoted” obstacle is the lack of a common railway gauge. The Middle East gauges are less challenging than many other regions of the world. The main gauge is 1435 mm, however international connections to the north and east represents break of gauge. (Ref. figure 8-7 in Chapter 8.4, “Middle East railway gauge”).

The trans-loading operation can be carried out with several different techniques. Manual or mechanical transshipment, boogie exchange and the use of variable gauge boogies are some examples. Dual or composite gauge operations are also alternatives. The most favorable solution has so far been transfer of containers between two set of wagons (using fork-lifts or cranes), due to less investments and easy operation.

The present (most usual) international trans loading operation has a cost connected to at least:

- The **cost** of moving physical units from one wagon to another (crane operation, forklifts etc),
- “Loss of **time**”²² or increased through transportation time, due to:
 - o the mentioned physical operation

²² Which is important, -since speed should one of the main advantages for the railways.

- o lack of logistical systems (e.g. no departing train waiting for the arriving train, lack of wagons, bureaucratically procedures etc)
- Security, due to the fact that the **risk** is highest when the cargo (e.g. a container) is not moving
- Loss of future income

Furthermore, there might be missing links due to geographical conditions, national conflicts, damage or economical reasons (not considered commercial viable to build the link). Whether or not the missing links are to be completed depends mainly on the importance of relevant trade opportunities compared with the costs of completing the link.

In addition to these physical discontinuities, there are political and administrative barriers like tariffs, border crossing permissions, customs, change of crew, safety inspections, bureaucratic administration procedures and various other impediments. These non-physical challenges can be considered as more important than the physical. Saving 5 hours by introducing a more efficient trans-loading procedure may not have considerable impact on the through time if administrative procedures are unchanged.

All these physical and non-physical barriers interrupt movement of goods and passengers, which again cause additional costs and thus affecting the future Middle East Railways as well as the railways connection to intermodale freight centers (like ports) and the international market.

Table 9-1 below shows the main railway connections in the Middle East and between the Middle East and neighboring countries.

Railway connections in the Middle East and neighboring countries										
		All countries (including neighbors)	Middle East railway countries							
			Iran	Iraq	Israel	Jordan	Lebanon	Saudi A.	Syria	Turkey
Middle East Countries	Railway countries	Iran								
		Iraq	(X)							
		Israel								
		Jordan	X3	Xb						
		Lebanon			(X)					
		Saudi Arabia								
		Syria	X3	X		Xb	(X)-			
		Turkey	X	X3		X3			X	
	No railways	Bahrain								
		Kuwait								
		Oman								
		Qatar								
		UAE								
		Yemen								
Other countries		Afgahnistan	(X)b							
		Azerbaijan								
		Armenia	X3b							(X)
		Pakistan	(X)b							
		Turkmenistan	Xb							
		Georgia								(X)b2
		Bulgaria/Europe								(X)
		Egypt			(X)	(X)				
Notes: X: Shows direct connections, not connections through third country, which is possible for many routes (X): Plan, project or partly operational 3: Connection, through 3rd country b: break of gauge (X)-: Connection probably damaged										
Source: Transportutvikling AS, 2008										

Table 9-1: Railway connections, The Middle East

9.3 Initiatives by multinational organizations

Several organizations have shown interest or developed international transport concepts for the Middle East Railways. Such organizations are UN (United Nations), EU (European Union), World Bank, ECO (Economic Cooperation Organization) and others.

Below is a brief overview of the initiatives by UN (ESCAP and ESCWA), the TRACECA project and the EU.

9.3.1 *Trans Asian Railway network (UNESCAP)*

Organizations such as the United Nation (UN) concentrate a part of their activities on transport matters.

The United Nations²³ Economic Commission for Asia and the Pacific (UNESCAP) is involved in transport related activities. As part of the Asian Land Transport Infrastructure Development Project (ALTID), the Trans-Asian Railways network (TAR) was a major issue. This work provides a framework for international routes and infrastructural standards.

The Trans-Asian Railway (TAR) is a potential network of over 80,000 kilometers of routes, linking 27 Member States of the United Nations regional body for Asia and the Pacific. The network's aim (including road and ports) is to offer efficient transport service within the region and between Asia and Europe as well as improved access for landlocked countries to major ports.

UNESCAP has adopted a step-by-step approach to TAR, initially dividing the network into four major components:

- A northern corridor connecting China, Kazakhstan, Mongolia, Russia and the Korean peninsula.
- A sub-regional network covering the Association of South East Asian Nations – Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam.
- **A north-south corridor linking Northern Europe to the Persian Gulf through Russia, Central Asia, the Caucasus region as well as across the Caspian Sea.**
- **A southern corridor connecting Thailand and the southern Chinese province of Yunan with Turkey through Myanmar, Bangladesh, India, Pakistan and Iran, with Sri Lanka as part of the corridor.**

The corridors in boldface have direct influence on the Middle East. The current status is that transport is in operation on sections of the corridors.

The map (*Figure 9-3*) below shows the overall TAR network.

9.3.2 *ESCWA-corridors & projects*

An agreement on international railways in the Arab Mashreq region, developed by the UN Economic and Social Commission for Western Asia (UNESCWA), was signed in 2003. Paragraph 1 in the agreement states that "The Arab Mashreq International Railway Network described in Annex I to this Agreement consists of the main axis having a north/south and east/west orientation and may include other axis and tracks to be added in the future, in conformity with the provisions of this Agreement".

²³ UN does have various programs influencing the Middle East railways; like the Special Programme for the Economies of Central Asia (SPECA) which is an undertaking of the Central Asian countries (CAS), UNECE and UNESCAP, and the Silk Road Area Development Programme (SRADP) is an element of the SPECA-program.

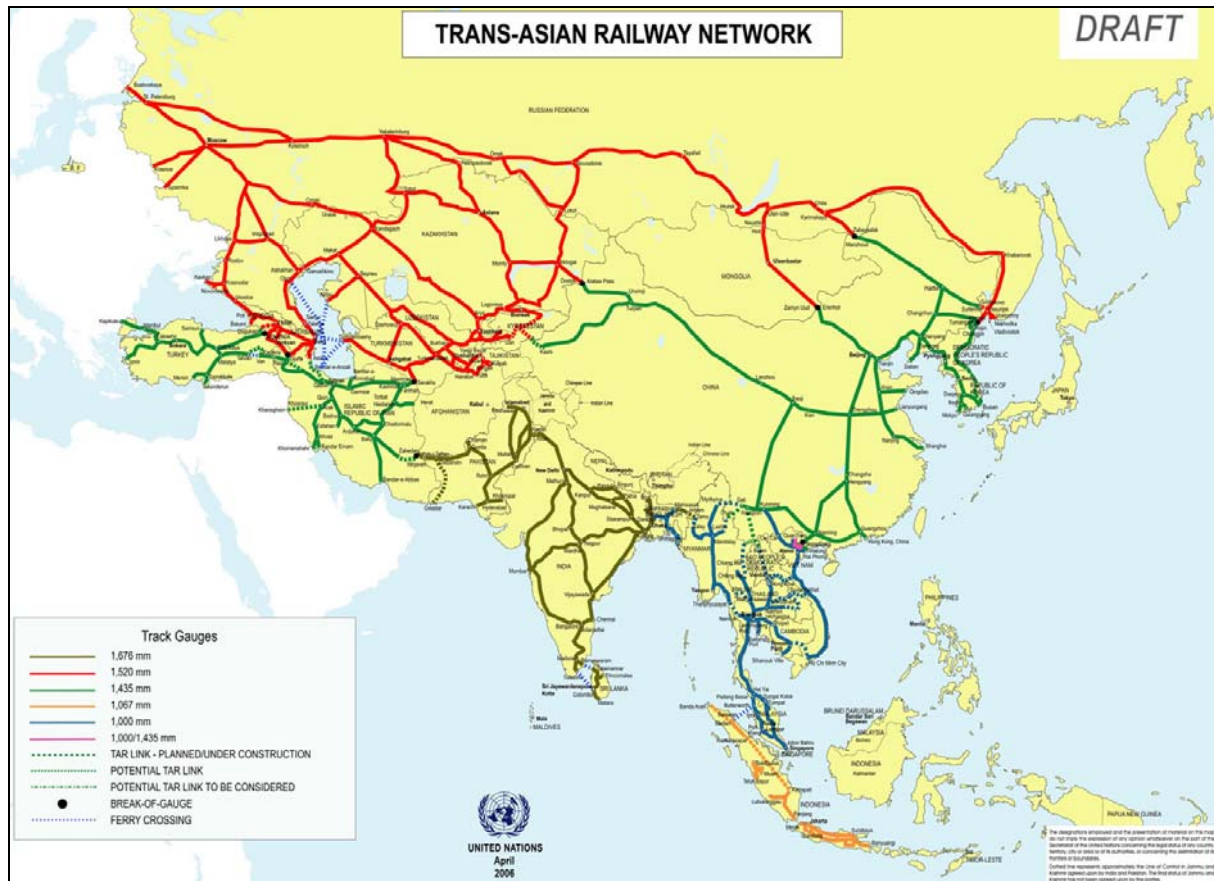


Figure 9-3: Trans-Asian Railway Network (UNESCAP, 2006)

During the signing ceremony on April 17 2003, the Agreement was signed by 7 countries: Egypt, Jordan, Lebanon, Palestine, the Syrian Arab Republic, the United Arab Emirates and Yemen. As per 2006 (Source: Seventh session of the ESCWA committee of transport, Beirut, 17-19 April 2006), nine member countries have signed the Agreement, namely Bahrain, Egypt, Jordan, Kuwait, Lebanon, Palestine, the Syrian Arab Republic, the United Arab Emirates and Yemen. Iraq, Oman, Qatar and Saudi Arabia have not signed. Furthermore, four member countries have ratified the Agreement, namely Jordan (16 April 2004), Lebanon (26 April 2004), Egypt (5 May 2004) and the Syrian Arab Republic (22 February 2005).

The Agreement defines two main groups of international corridors where the development potential is considered relevant; "North-South" and "East-West". Several of the corridors are not operational due to standard and missing infrastructure. Some of the countries which have signed the agreement do not have any kind of railway infrastructure. The corridors are as follows:

NORTH-SOUTH AXIS

- **Iraq-East Arabian Peninsula**
 - o Yaaroubia border point (Syrian Arab Republic/Iraq) - Rabieyyah border point (Iraq/Syrian Arab Republic)- Mosul- Baghdad-Samawah- Nasiriyah- Basrah- Umm Qasr- Kuwait- Nuwayseeb border point (Kuwait/Saudi Arabia)- Khafji border point (Saudi Arabia/Kuwait)- Abu Hadriyah- Dammam- Salwa-Batha'a border point (Saudi Arabia/United Arab Emirates)- Al Ghweifat border point (United Arab Emirates/Saudi Arabia)-Abu Dhabi- Dubai - Sharja-Fujairah- Kalba border point (United Arab Emirates/Oman)- Khatmat Malahaw border point (Oman/United Arab Emirates)- Sohar- Muscat- Thumrayt-Salah.
- **Middle Arabian Peninsula**
 - o Zarqa'- Al Azraq- Omari border point (Jordan/Saudi Arabia)- Hadithah border point (Saudi Arabia/Jordan)- Quoryat - Dawmat al-Jandal- Ha'il- Buraydah- Riyadh- Al Kharj- Harad- Batha'a.

- *Syrian Arab Republic-Jordan-Saudi Arabia-Yemen*
 - o Midan Ikbis- Aleppo- Homs- Maheen- Damascus- Dara'a border point (Syrian Arab Republic/Jordan)- Jaber border point (Jordan/Syrian Arab Republic)- Amman- Ma'an- Al Mudawara border point (Jordan/Saudi Arabia)- Halat Ammar border point (Saudi Arabia/Jordan)- Tabuk- Medina- Yanbu- Rabigh- Jeddah- Darb- Al Tuwal border point (Saudi Arabia/Yemen) – Harad border point (Yemen/Saudi Arabia)- Hodeidah- Al Mukha- Bab al-Mandab.
- *Homs-Rayyaq*
 - o Homs- Al Qusayr-Rayyaq.
- *East Mediterranean*
 - o Lattakia- Tartous- Akkary- Dabbousieh border point (Syrian Arab Republic/Lebanon)- Abboudieh border point (Lebanon/Syrian Arab Republic)-Tripoli- Beirut- Tyr.
- *Nile Valley*
 - o Tanta- Cairo- Qena- Aswan- Wadi Halfa.

EAST-WEST AXIS

- *Iraq-East Mediterranean*
 - o Khanaqin- Baghdad- Haklania- Qua'im border point (Iraq/Syrian Arab Republic)- Bou Kamal border point (Syrian Arab Republic/Iraq)- Deir Ez-Zor- Aleppo- Lattakia.
- *Middle Syrian Arab Republic*
 - o Yaaroubiah border point (Syrian Arab Republic/Iraq)- Kamishli- Hasaka- Deir Ez-Zor- Tadmur- Maheen- Homs- Akkary.
- *Damascus-Beirut*
 - o Damascus -Beirut
- *West Iraq-Jordan*
 - o Haklania- Tarabil border point (Iraq/Jordan)- Karamah border point (Jordan/Iraq) - Safawy- Zarqa' - Amman.
- *Mediterranean Southern Coast-Nile Delta*
 - o Gaza- Rafah border point (Occupied Palestinian Territories/Egypt)- Arish- Verdun Bridge- Ismailia- Tanta- Alexandria- Salloum.
- *Ma'an- Verdun*
 - o Ma'an- Aqaba- Nuweiba- Nakhl - Verdun Bridge.
- *Safaga-Al Kharja*
 - o Safaga- Qena- Al Kharja.
- *Jubail-Jeddah*
 - o Jubail- Dammam- Riyadh- Mecca- Jeddah
- *Doha*
 - o Doha- Salwah
- *South Arabian Peninsula*
 - o Thumrayt - Mazyounah border point (Oman/Yemen)- Shahan border point (Yemen/Oman)- Gheizah- Mukalla- Aden- Bab al -Mandab.

9.3.3 TRACECA

TRACECA (Transport Corridor Europe–Caucasus–Asia) aims to develop a West- East transport corridor from Europe, across the Black Sea, through the South Caucasus and the Caspian Sea, building on the Trans European networks on EU territory, the Pan European Transport Corridors in Europe, especially the Black Sea Pan European Transport Area (PETrA) and the New Silk Route to Asia. After the start-up phase 1993-1995, projects focused on making the physical corridor operational and on strengthening the Black sea – Caspian link. Since the signing of the Multilateral Agreement in Baku, TRACECA has developed into a program of transport cooperation around a Europe – Asia Corridor.

Countries included in the TRACECA-program are Azerbaijan, Armenia, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Turkmenistan, Ukraine, Uzbekistan, Romania, Bulgaria and Turkey. The TRACECA corridor is the main East-West corridor which only runs through countries included in the

program. When the activities regarding the development of the Europe-Asia Transport Connections are taken into account, the TRACECA strategy aims to provide a sustainable effective and integrated multimodal transportation system between EU and TRACECA as well as among the TRACECA countries. Turkey has taken part in the TRACECA program with Haydarpasa, Samsun, Derince and Hopa ports and Istanbul-Ankara, Ankara-Kayseri, Kayseri-Sivas, Sivas-Samsun, Sivas-Kars railway lines.

The TRACECA Corridors are running through many countries and it faces political challenges, and the routes are hampered by several discontinuities. It could be mentioned that, according to TCDD, the southern ports in Turkey are not accepted by the TRACECA Secretariat as well as the port of Izmir. This issue may be revised when the Marmaray project and the railway link Kars-Tbilisi-Baku is completed, as these ports will be elements of the southern route approaching Europe. At the end, this will of course be the choice of the customers.

For the purpose of this study, which mainly focuses on the China-Central Europe trade, -TRACECA will face strong competition from sea transport due to the crossing of the Black Sea or Turkey. Several ports are located in the region (Aegean Sea) and there are increasing ocean based connections with China. The port of Athens (Piraeus) is located close to the Istanbul strait and it ranks among the top-10 European container ports (East Med's largest port). Recently (2006) the first container ship of the state-owned China Ocean Shipping (Group) Co., known as COSCO, docked at the Port of Piraeus. COSCO is currently evaluating a project to develop a transshipment container terminal on the Greek island of Crete. The Port of Thessaloniki is also located close to the Istanbul strait and has shown a significant increase in container traffic, mainly due to the increase of imports from the Far East, particularly China. Other ports, like the port of Izmir in Turkey, are also located in the same region.

TRACECA is a huge project with a permanent secretariat. The organization has knowledge and competence which is valuable for the further development of the Europe-Asia (China) Bridge.

A map of the TRACECA is shown on the next page (Source: TRACECA Secretariat, 2006)

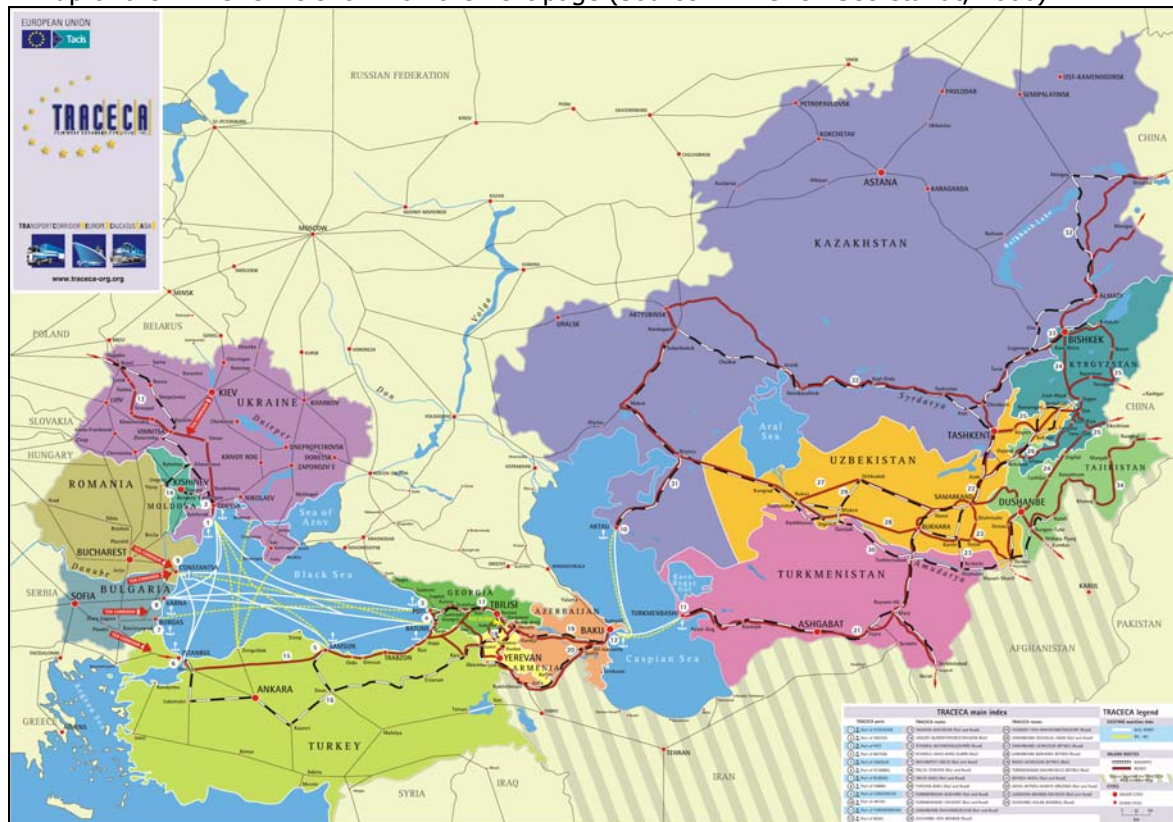


Figure 9-4: TRACECA

9.3.4 The EC major trans-European transport axis

In June 2004, the European Commission decided to establish a High Level Group (the Group) for the extension of the major trans-European transport axis to the neighboring countries and regions (*"Networks for peace and development"*). This was to extend the concept of European Neighborhood Policy into the transport field and to find better ways to connect the European Union with the neighboring countries and regions. Former Commission Vice President Ms Loyola de Palacio was appointed Chair of the Group, which is comprising of 16 neighboring countries, the 27 EU States, the European Investment Bank, the European Bank for Reconstruction and Development and the World Bank.

The Group identified five major transnational axis:

- Northern axis: to connect the northern EU with Norway to the North and with Belarus and Russia and beyond to the East. A connection to the Barents region linking Norway through Sweden and Finland with Russia is also foreseen.
- **Central axis: to link the centre of the EU to Ukraine and the Black Sea and through an inland waterway connection to the Caspian Sea. Connections towards Central Asia and the Caucasus are also foreseen, as well as a direct connection to the Trans-Siberian railway and a link from the Don/Volga inland waterway to the Baltic Sea.**
- **Motorways of the Seas: linking the Baltic, Barents, Atlantic, Mediterranean, Black and the Caspian Sea areas as well as the littoral countries within the sea areas and with an extension through the Suez Canal towards the Red Sea.**
- **South Eastern axis: to link the EU through the Balkans and Turkey to the Caucasus and the Caspian Sea as well as to Egypt and the Red Sea. Access links to the Balkan countries as well as connections towards Russia, Iran and Iraq and the Persian Gulf are also foreseen.**
- South Western axis: to connect the south-western EU with Switzerland and Morocco and beyond, including the trans-Maghrebin link connecting Morocco, Algeria and Tunisia. An extension of the trans-Maghrebin link to Egypt as well as a connection from Egypt to the South towards other African countries is also foreseen.

These axis extend and complement the major axis of the trans-European transport network by interconnecting them with the networks of the neighboring countries. The Group put forward a number of projects that were classified into two categories, depending on their maturity: projects ready to start before 2010 and projects of longer term interest (beyond 2020).

The Group stresses the need for further studies and analyses, particularly concerning the economic viability, technical specification, environmental impact and financing mechanisms, before the projects could be considered for implementation.

The maps²⁴ (below) show the Northern/Central axis and the South Eastern axis, which are proposed by the High Level Group. These axis are considered as important for the trade between the Middle East and Europe.

²⁴ Source: "Network for peace and development", European Commission, November 2005

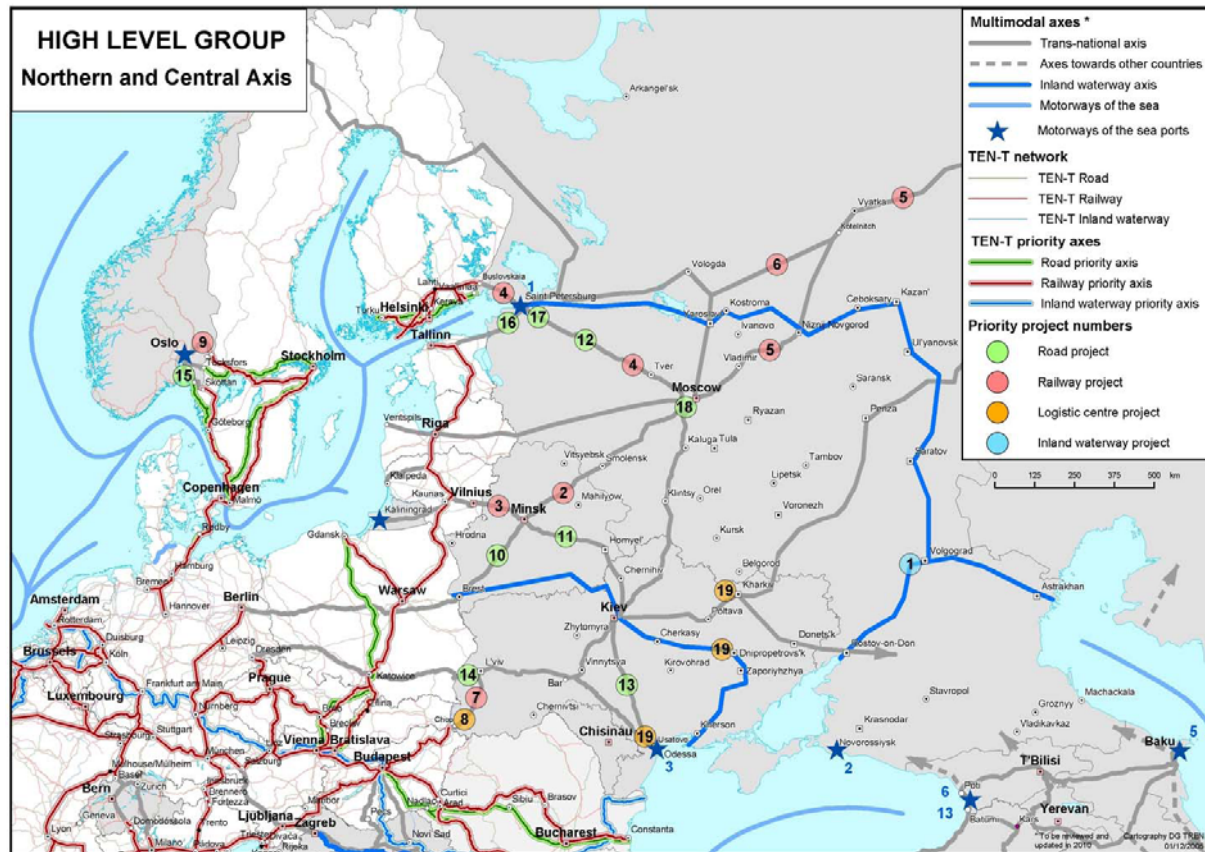


Figure 9-5: EU High Level Group, Northern and Central axis

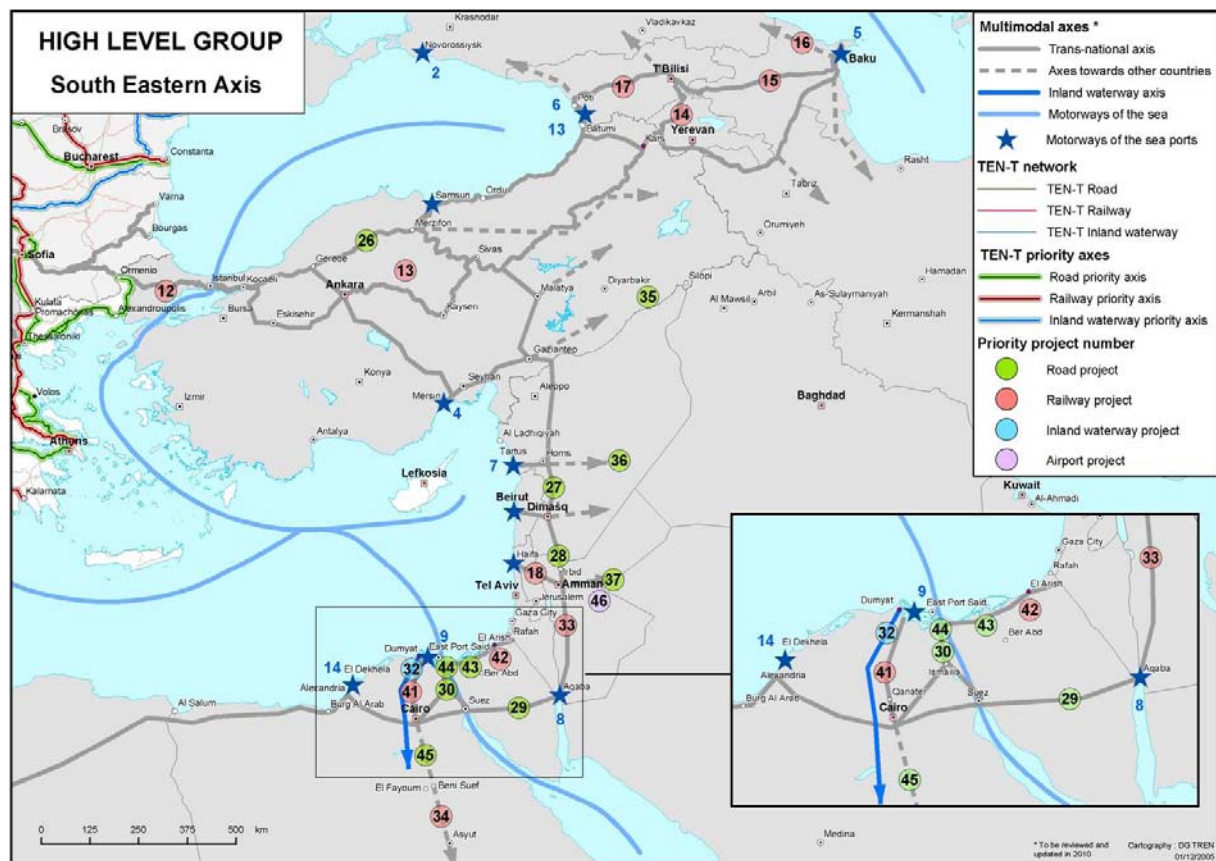


Figure 9-6: EU High Level Group, South Eastern Axis

9.3.5 TINA (Transport Infra Needs Assessment) - Turkey

Turkey is bordering Europe and the TINA Turkey project should be of importance for both European and the Middle East Countries. The project I financed by EU and recently completed. TINA Turkey Project was carried out with the ambition of defining sections of the future Trans-European Transport Infrastructure Network.

The overall objective of the project is to support the development of a multi-modal transport network within the Republic of Turkey, extending the European TEN-T into the territory of Turkey. Like the TINA processes undertaken for Central and Eastern European countries, the network in Turkey is ment to be multi-modal. In this context, the project will study (i.e. define and assess) all modes of transport, comprising road and railway transport, maritime transports & ports, aviation & airports and intermodale links (terminals), as a unique, integrated transport system. The final report by the TINA Turkey has been approved by the Steering Committee.

9.4 Some international railway corridors in the Middle East

The Middle East has a strategic logistical location at the crossroad of the major global maritime trade lanes between Asia and Europe, as well as along the path of the historical Silk Road.

Below we will focus on a few of the potential land-corridors in the Middle East. Maritime connections and synergies are commented upon in chapter 9.5 as well as the port chapter (7.5.2). The map (Figure 9-7) below shows potential export/import-corridors/directions based on market perspectives, i.e. to (from markets which is expected to grow or markets where volumes are huge). The intention is not to include the entire potential, only to focus on some markets/corridors²⁵ of international interest. Alternative routes do exist.

The map shows connections to:

- Europe (because of market size)
- CIS/Russia, China and India because of market growth and perspectives
- Africa, because of market growth and long term perspectives

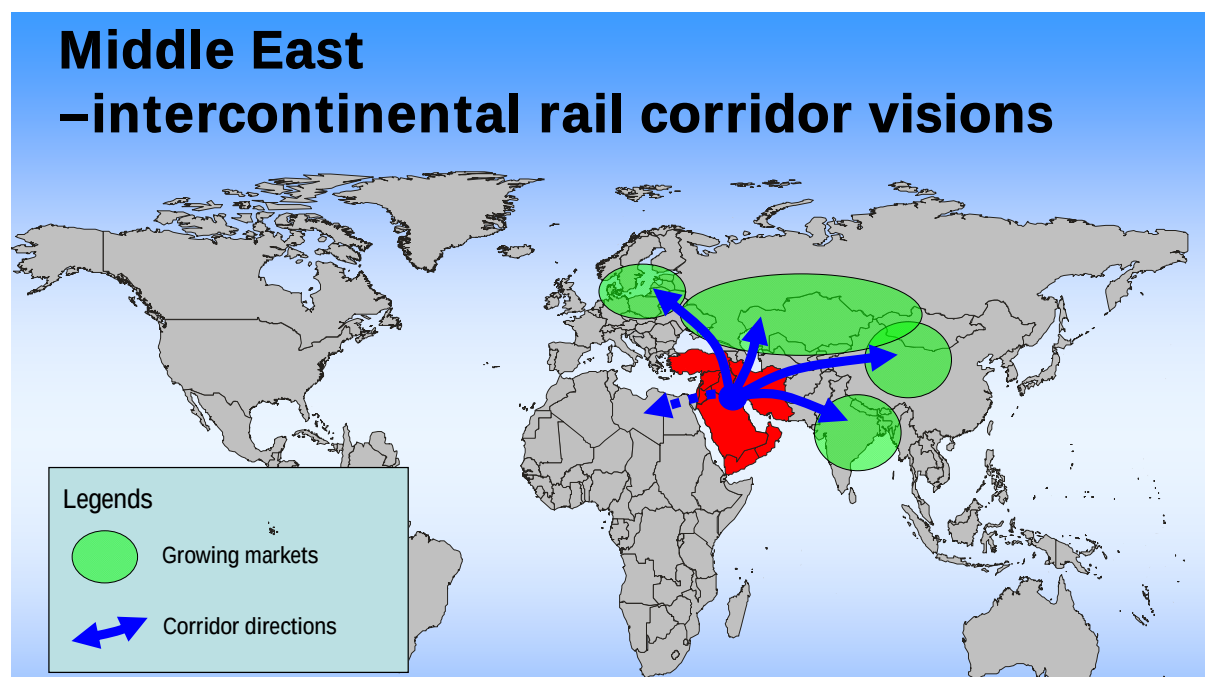


Figure 9-7: Some potential international railway corridors

²⁵ The map considers the Middle East as one region and the direction of the arrows are not be understood as Iran as the origin and destination for all potential routes. The markets are highlighted and as an example connections between Asia and Europe, through the Middle East could obviously be carried out through Turkey.

The corridor visions (trade directions) mentioned above, as well as many projects/corridors not mentioned, is important for the long-term development of the Middle East railways. The operational corridors and projects which at the present are truly intercontinental and operational are few.

Middle East – Western and Southern Europe

There are several potential routes between the Middle East and Europe. The perhaps most interesting and challenging opportunities are the *International East-West Corridor* and the *Marmaray-project* (Istanbul Tub Tunnel and upgrading of the Gebze-Halkali Suburban Trains).

The International East-West Transport Corridor (IEWTC)

IEWTC covers international/intermodal transportation and transit among countries in Asia, Middle East, Europe and Africa. The corridor connects Central Asian Countries (Turkmenistan, Tajikistan, Kazakhstan, Uzbekistan etc), South East Asian countries (China, Malaysia etc), Indian Ocean countries (like India), Pakistan and countries in the Persian Gulf. The main connection point is Iran and the westbound connections go through Iraq and to the Syrian port of Lazghyyeh. The maritime section (Mediterranean) is divided into two mains rotations; one to European countries and one to Africa through Tunisian ports.

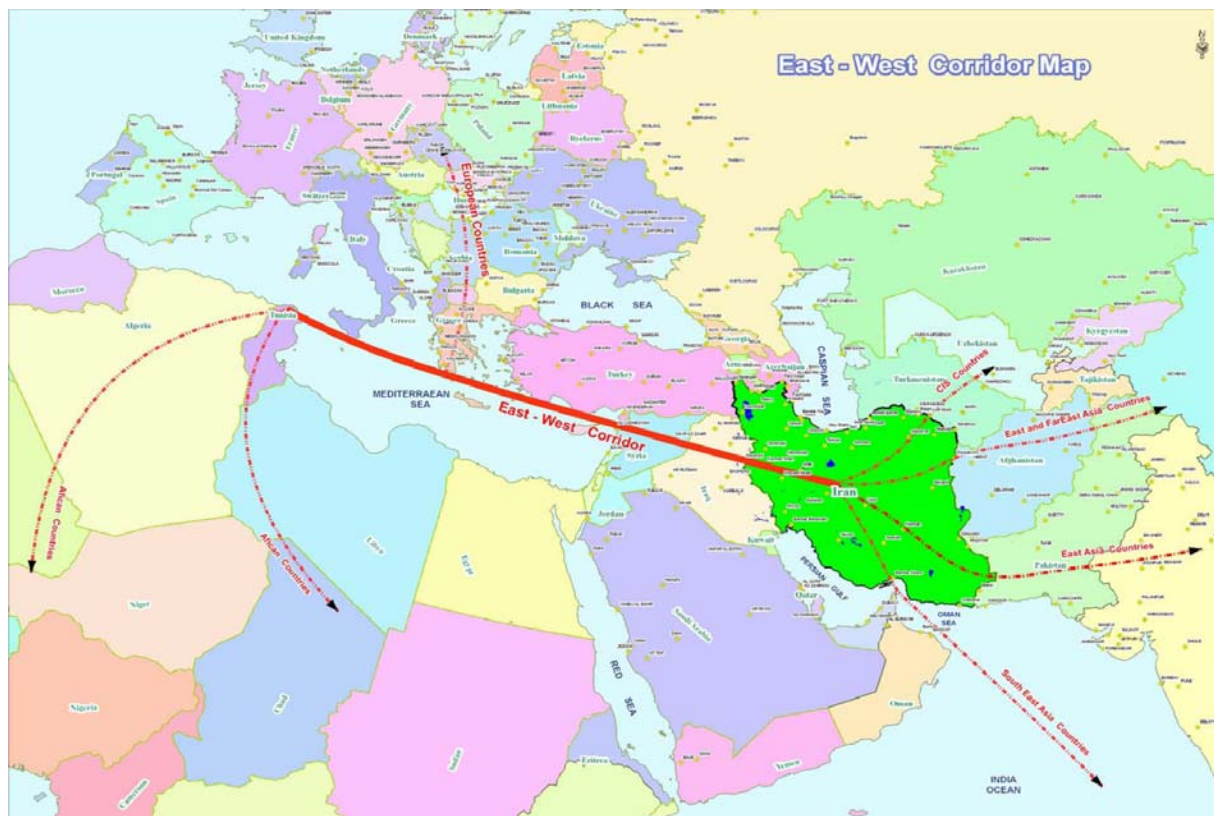


Figure 9-8: The International East-West Transport Corridor
(Source: Ministry of Road and Transportation, Iran, 2007)

The main corridor is **Iran-Iraq-Syria-Greece-Tunisia** and is based on the following sub-routes (Source: Ministry of Road and Transportation, I.R.Iran):

- Route 1: Iran – CIS countries
- Route 2: Iran – East and Far East Asia
- Route 3: Iran – East Asia
- Route 4: Iran – South East Asia
- Route 5: Greece - Europe
- Route 6: Tunisia - Africa

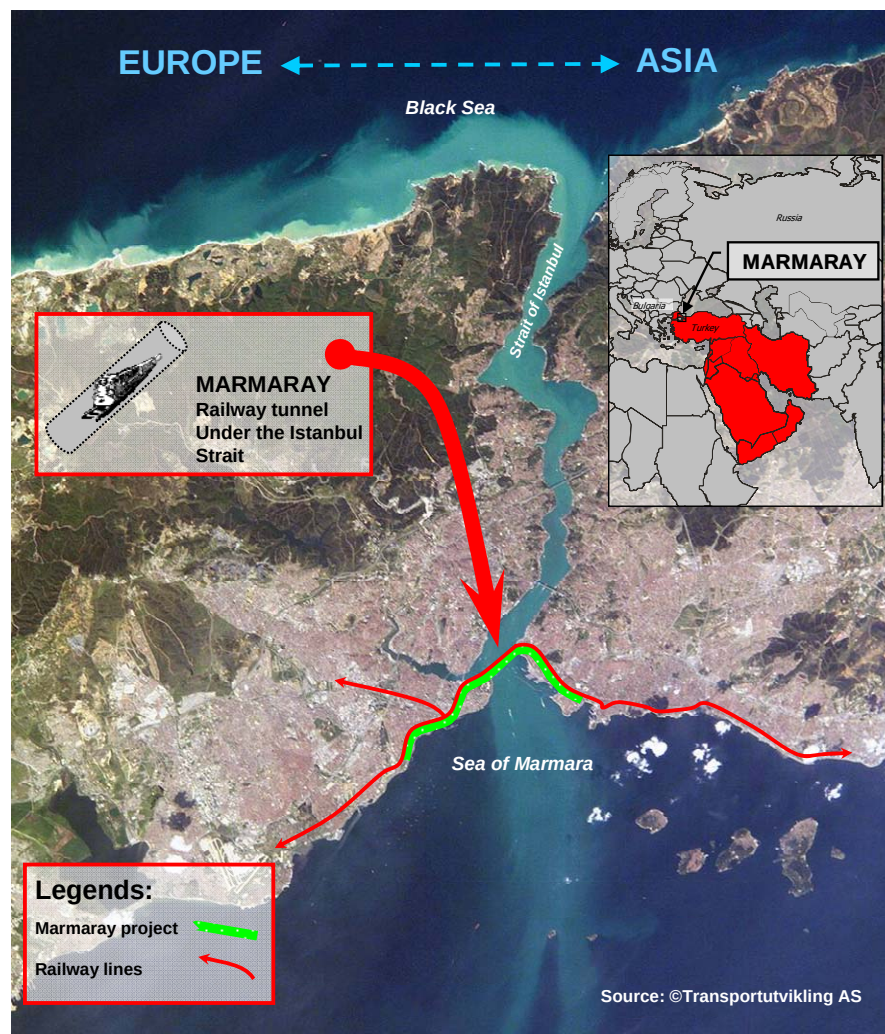
The westbound railway connection from Iran is challenged by missing links between Iran/Iraq and between Iraq and Syria. East of Iran, the connection to Pakistan has to be completed before South East Asia can be reached. In Africa (from Tunis) there are railway connections to Algeria and Morocco, while connections south of the Maghreb region are missing.

This project is long-term and not only challenged by missing railway links, but also operational standard (like the railway section to Iran in Pakistan where axle load is only 11 tons) as well as other political and logistical challenges.

Based on a market perspective and distances between major markets, this project (or sections of it) may be of long-term interest.

The Marmaray-project

This project does not only offer a connection to Europe, but also elimination of one discontinuous point in the logistical chain between Europe and Asia.



This Project is one of the major transportation infrastructure projects in the world at present and it will improve the railway infrastructure between eastern and western markets. The entire upgraded and new railway system will be a 76,3 km long high capacity line. The Istanbul Strait will be crossed by an immersed tube placed 56 meters below sea level and drilling tunnels of 12.2 km. under both sides of the city.

Construction of the Marmaray project started in May 2004. Its completion is expected to occur in 2009. The completion date may be delayed by the excavation of Byzantine archaeological findings on the proposed site of the European tunnel terminal.

Figur 9-1: The Marmaray project

The Middle East railway connections to Turkey (and Istanbul Strait) run from Syria, Iraq or Iran. The link from Iran is challenged by the Lake Van maritime connection (Van-Tatvan) which represents discontinuity in the continuous railway operation. The only way to eliminate the ferry is to build a new railway linking the western and eastern regions of Lake Van.

A few facts concerning the project (Source: <http://www.marmaray.com/html/technical.html>):

• Existing commuter rail:	10.000 passengers
• Upgraded commuter rail:	75.000 passengers
• Design speed:	100 km/hour
• Maximum operational speed:	100 km/hour
• Expected average speed:	45 km/hour
• Travel time total between Gebze and Halkali:	
o Existing commuter rail and ferries/taxi to or from boat:	185 minutes
o New and upgraded uninterrupted commuter rail:	104 minutes

Table 9-2: MARMARAY specifications

(India)-Middle East – Northern Europe /West Russia

There are various route options to connect the Middle East and Northern Europe. For many of the Middle East countries, the shortest route will pass the Caspian region by sea or by land.

The initial founders of *The International North-South Transport Corridor (INSTC)* were India, Russia and Iran. Later on several other countries have joined the corridor project and there is a strong political support for the route.

According to INSTC web-pages (July 2007) the INSTC is a multi modal transportation established in on September 12.2000 in St. Petersburg by Iran, Russia and India, for the purpose of promoting transport cooperation among the Member States. This corridor connects the Indian Ocean and the Persian Gulf to the Caspian Sea via the Islamic republic of Iran, and then onwards to St. Petersburg and Northern Europe via the Russian Federation.

The route is in operation. By using water transport crossing the Caspian Sea, there are no missing links (technically).



The route involves several trans loading operations (Caspian Sea (2), Iranian port (1) and Mumbai (1). The route can be developed as an overland route from Iran to Russia by utilizing railway infrastructure on the western side of the Caspian Sea:

- 1) A direct link from Iran through Azerbaijan may be possible when the missing link between Iran and Azerbaijan is completed.
- 2) Iran can be connected to the network in Azerbaijan (and Russia) through Armenia.
- 3) Connecting Russia through Georgia is challenged by
 - a. The border between Russia and Georgia is closed (since 2006)
 - b. The railway network in Abkhazia has been shut down since 1992/93.

Even if the Russian/Georgian border is opened, the railway network in the disputed region of Abkhazia has to be restored.

Figure 9-9: The North-South Corridor

The map (*Figure 9-9*, source: INSTC, website) shows to alternative Iranian ports in the south. Bandar Abbas (Shahid Rajaee) in the west and Chabahar in the east (outside Hormuz). Today, no railway connection exists to/from Chabahar²⁶.

The corridor (INSTC) can be connected further north to the Barents Region (Murmansk), without gauge break. The Finnish or Russian railway system can be used and the Middle East countries can develop a connection to new markets (fish products, oil equipment, forest products etc)

It has to be mentioned that Russia consider the North-South International Transport Corridor as part of a strategic partnership with the countries to the south and has duly signed an Intergovernmental Agreement on its construction with India and Iran in September, 2000. The Russian section of the North-South ITC is approximately 3,000 kilometres and, depending on the particular route, accounting for 30-50% of the Corridor's total length over land.

Middle East – Central Asia and North West China

The Middle East Railway connection to Central Asia goes through Iran (South of the Caspian Sea) and Turkmenistan. Other Middle East countries have to use the Iran connection, cross the Caspian Sea or enter Russia/Kazakhstan north of the Caspian Sea.

Between Iran and Turkmenistan there is a break of gauge (1435/1520). The link is technically operational through the Sarakhs border station.

From Turkmenistan the route to North West China goes through Uzbekistan to Kazakhstan. From Kazakhstan the route runs through the border crossing stations of Dostyk (Kazakhstan) and Alashankou (China) where the distance is less than 500 km to the capital of the Chinese Xinjiang region (Urumqi). Between China and Kazakhstan, the gauge changes from 1435 to 1520.

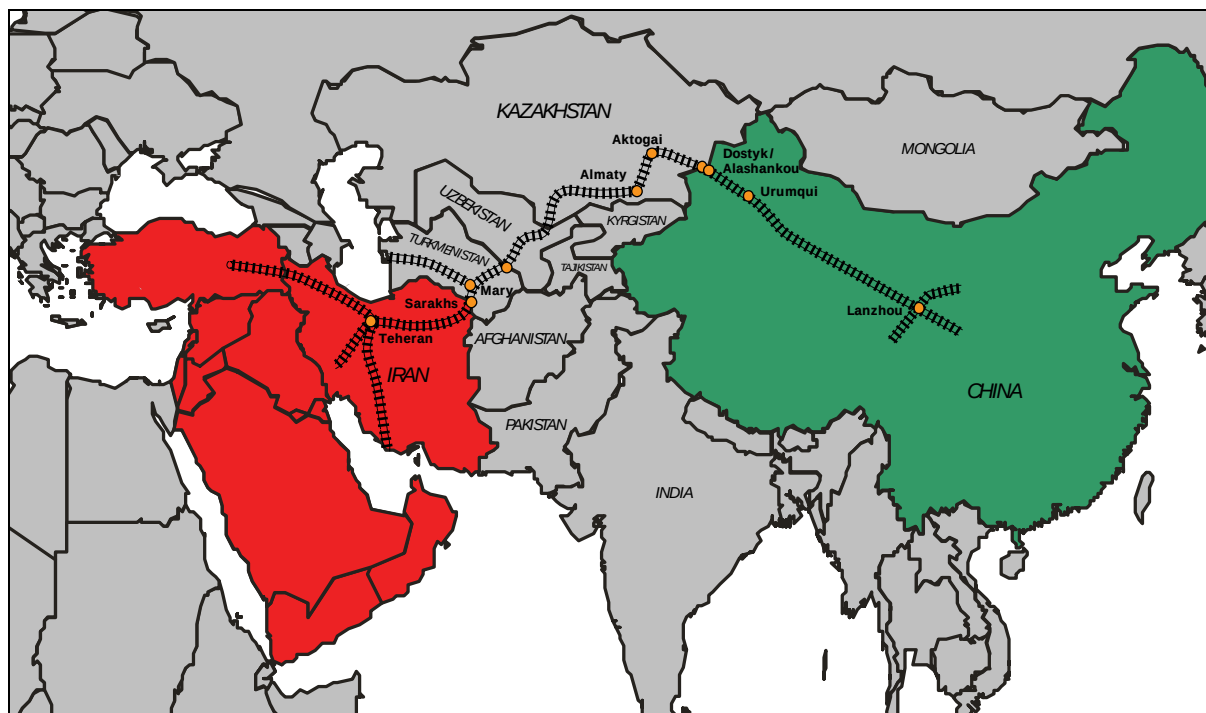


Figure 9-10: Middle East connections to NW China

Kazakhstan is an important transit country for transports between east and west. The gauge in Kazakhstan is 1520 mm, while China and the most of the Middle East countries have 1435 mm gauge. Kazakhstan has developed plans a 1435 mm railway crossing the entire country. Theoretically this line

²⁶ A feasibility study is ongoing.

(if built) can be linked to the Middle East (not only Europe) and contribute to an intermodale one-gauge connection between Iran and China.

Middle East – South and East Asia

The most relevant (present) option for the Middle East countries to connect to South and South-East Asia is through Middle East ports and maritime transports. A future railway corridor may go from Iran through Pakistan to India and further through Bangladesh to South-East Asia (Myanmar, Thailand, Malaysia etc).

There are several obstacles and missing links in the South-East Asian region.

In the Middle East region, the first challenge to be solved is the connection between Iran and Pakistan. This connection (Bam-Zahendan) does not exist, but is under construction by the Iranian railways. The connection further into the Pakistan railway network is of low standard and has to be modernized/rebuilt if an effective corridor shall be developed.

When looking into Iran's Eastbound connections, it should also be mentioned that by linking Iran's railway to Quetta (Pakistan), Pakistan will be connected to the Central Asian countries and Turkey.

Middle East - Africa

There are no railway connections between the Middle East countries and Africa. The International East West project (IEWTC, see figure 9-8) focuses on Middle East-Africa connection, however as an intermodale link to Tunisia by using sea transport.

Future railway connections to Egypt (which is the closest African country in the north) may be done by linking the Israeli railways through Sinai, building a bridge over Aqabah etc.

There are also ideas of connecting the Middle East to Africa by crossing the southern part of the Red Sea. The Ministry of Transportation of Yemen has recently announced that it has sent an official letter to the United Nations Economic and Social Commission for Western Asia (ESCWA) to conduct a study for a project linking Yemen and Djibouti by a bridge. Today, there are no railways in Yemen and Djibouti is only connected to Ethiopia by rail.

The North African railway system is not interconnected. There are railways in Morocco, Algeria and Tunisia and Egypt. In Libya, no railways are operational. Libya has projected railways links north-south as well as east-west, connecting Tunisia and Egypt.

The North African railway system has no connection to countries in the centre and south of Africa.

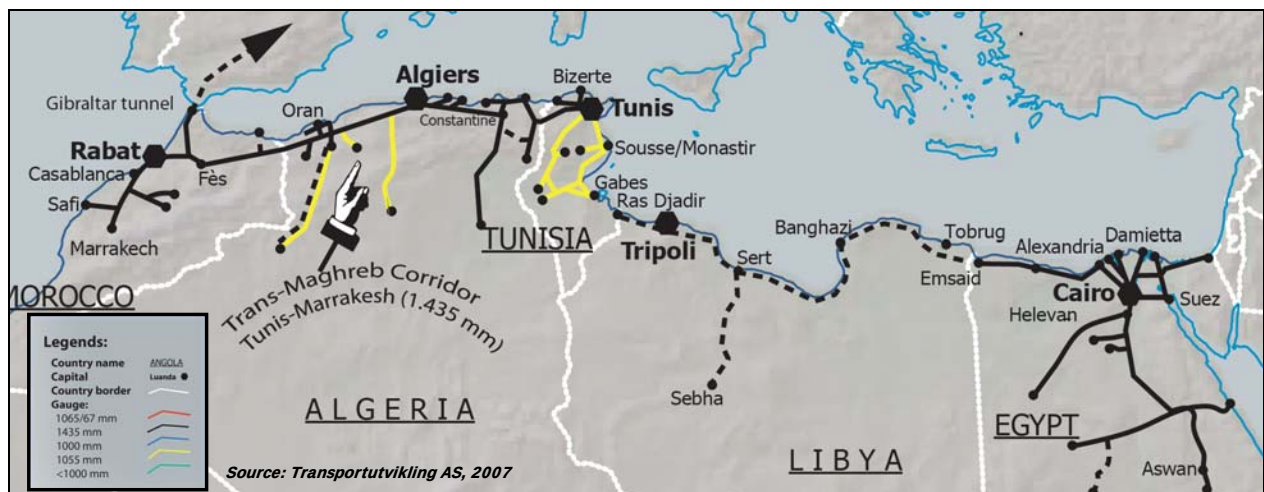
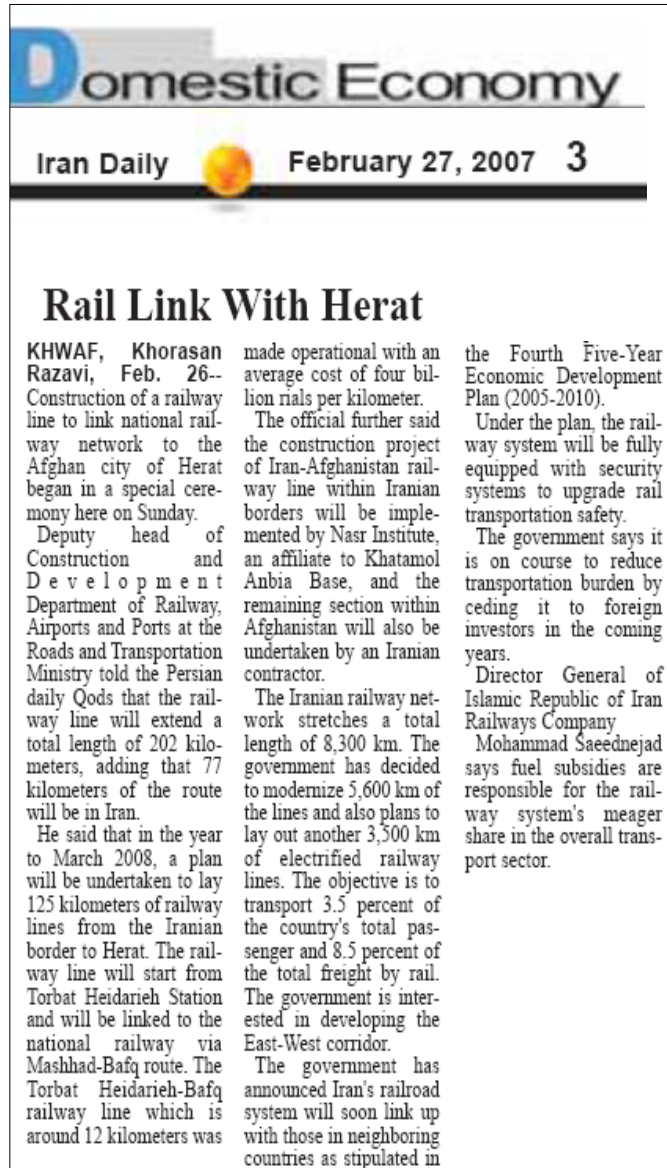


Figure 9-11: The North African railways

9.5 Other initiatives

There are several national as well as other initiatives focusing on the railways in the Middle East. A few initiatives are mentioned below.

The Eastern Civilization Railways (Iran-Afghanistan)



Iran has inaugurated a project to expand its rail link toward Afghanistan as part of a wider plan to provide regional and European train access to its eastern neighbor.

The project, named 'the Eastern Civilization Railways', has connected Khaf, northeast of Iran, to a local station in Torbat Heidariyeh which is projected to be about 120 kilometers from the Afghan railway network coming from Herat.

According to PressTV, it will provide "access for Afghanistan to connect to the Persian Gulf, Turkmenistan and also Europe through the Iranian rail grid".

The 'Eastern Civilization Railways' is expected to be used for the transport of passengers and minerals between the two countries.

The connection to Herat (Afghanistan) is projected to be completed after 2008.

Figure 9-12: The Eastern Civilization railway

The Saudi Land Bridge

Historically it was a good idea to avoid the great Arab land masses and sea transport contributed to an effective transport solution between east and west. Today, 1000-1500 years later, land transport is an alternative and the Saudi Land Bridge is a national project in Saudi Arabia connecting the ports of Dammam and Jeddah. This Land Bridge will connect two main maritime areas; The Red Sea (Jeddah) and the Persian Gulf (Dammam), and is therefore of international interest. Various projects do also exist to connect this Land Bridge to the north and the south.

This Land Bridge may not only be an alternative for the domestic trade in Saudi Arabia. It may also be a tool where synergies between sea and rail can be developed. The Land Bride is shown in figure 9-13 (Source: SRO, Saudi Railway Organization).

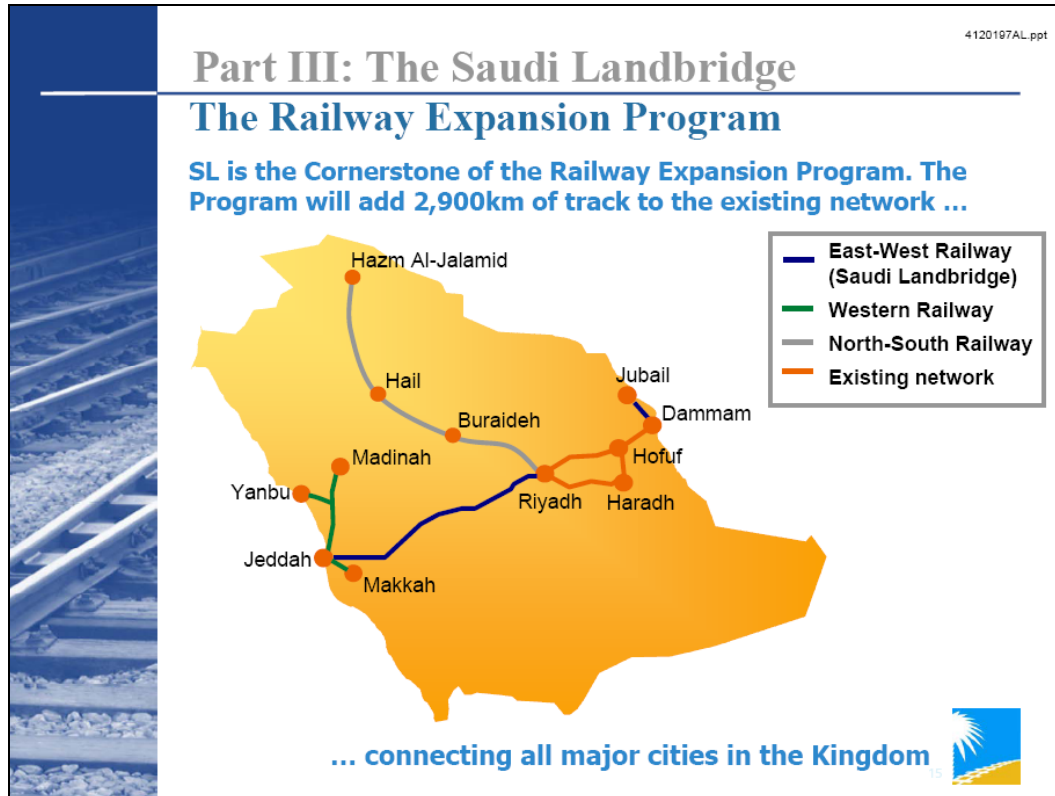


Figure 9-13: The Saudi Land Bridge (projected)

Maritime synergy

A few alternatives where maritime synergies can be developed (Deep-Sea, lakes etc)

Preliminary map Middle East Railways

Shipping lines and deep-sea carriers are often considered as competitors to the railways. For many international routes, they are. Railway corridors operating in parallel with deep sea shipping routes have tremendous challenges due to economies of scale and maritime transport systems which can operate without almost any kind of discontinuity in the logistical chains.

For many routes it is possible to develop synergies between sea and rail. The railway carriers, railways organizations and governmental authorities should have a stronger focus on such potential synergies. The figure shows a few opportunities where synergies may occur, and benefit the railways of the Middle East.

When doing intermodal transports, ports and shipping lines can seldom be avoided, which gives them the status of important chain players. If the port fails, the railway and the shipping line fails. Many railways should be stronger involved in cooperation with ports and shipping lines.

When approaching a shipping line it is important to focus on the interest of the shipping line, and not only the railways. There are several strategies which may be considered, however the following issues are often of interest when approaching a shipping line in a global market:

Satisfy global standards

- A shipping line is a global player in a global market where global standards have to be satisfied
- If the Ocean Carriers have an option, they will chose partners satisfying the same criteria's
- The railways have to prove their viability

Focus on the entire supply chain (SCM)

- A shipping line has customer focus ("who pays the bill"), not only segment (ocean) focus.
- The railways have to prove that (at least) the railway-section of the chain is viable

Segment focus

- A shipping line does also have a strong focus on their own segment, based on profit targets. They will sail a shorter distance if they can obtain the same revenue
- The railways should understand the logic behind fleet rotation and fleet capacity utilization
- It should be possible to develop a win-win situations

10 The future

10.1 Transportation work

Projecting future railway transport in the Middle East includes serious uncertainties and should be further looked into by the UIC. The causal connection among drivers (see chapter 7) influencing railway transports are complicated to assess. These drivers' impacts on various conditions are also estimated on different levels by different analysts. Furthermore, railway development is heavily dependent on political decisions.

By assuming that there is a connection between economic growth²⁷ and freight transports, and between population growth and passenger transports, - estimates are possible to create. Historically, this connection is possible to verify for many countries, but changes in other variables may counteract the predicted outcome. Furthermore, no changes or improvements in conditions like infrastructure or operational systems may also influence the projections, due to shortage of capacity or lack of quality.

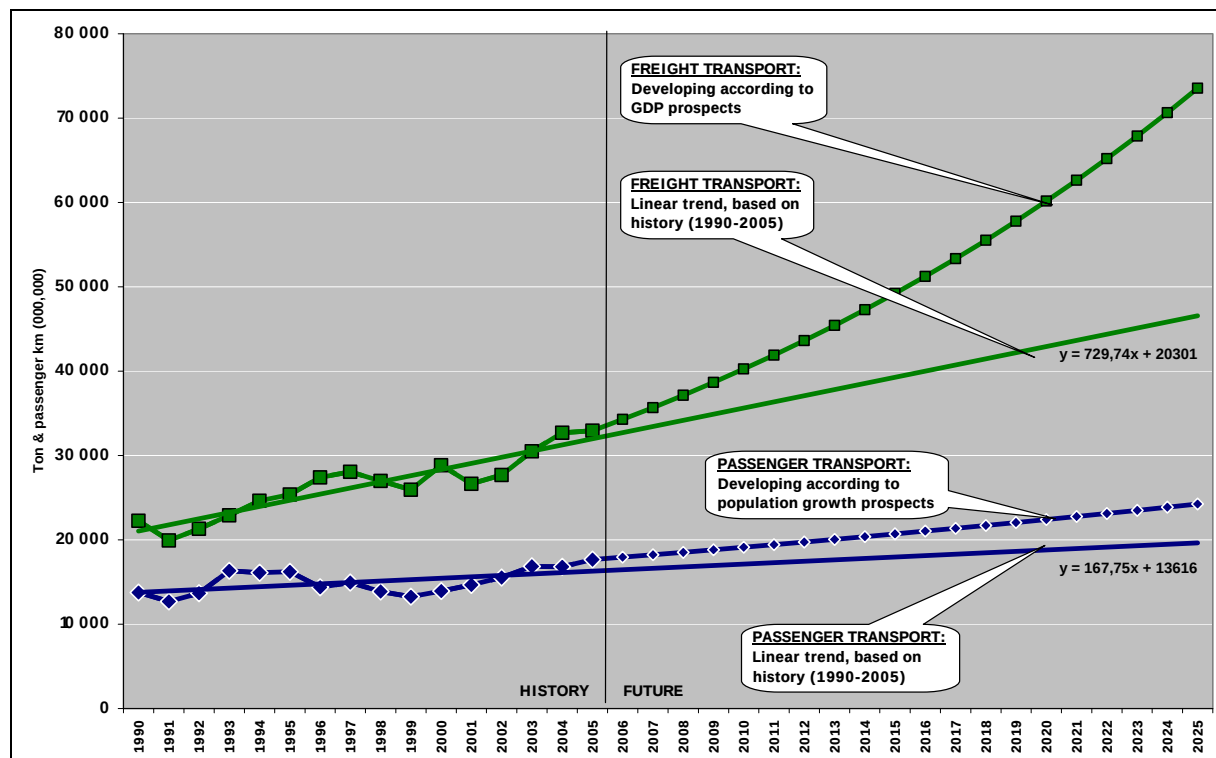


Figure 10-1: Future railway transport in the Middle East

The figure above shows passenger kilometers and ton kilometers, as a total, for all Middle East countries. The total is strongly influenced by the development in large countries like Iran and Turkey. Empirical data ("History") is shown at the left part of the figure and the projections ("Future") to the right.

Freight transports show quite stable growth since 1990 and the Middle East average is +2.6% per year. There are huge variations among the countries. While Iran has shown an annual growth of close to 6%, Iraq's freight transport has declined by close to 10% per year. The historical growth in freight transports has been lower than the historical growth in GDP. A linear trend, based on the history from 1990 to 2005, concludes with 40% higher transportation volume in 2025, while a scenario based on the expected GDP growth, more than doubles the 2005/06 volumes by 2025.

²⁷ World recession may of course be an issue for the future. So far the Middle East is not much affected by the US slowdown (Drewry, Dubai, January 2008).

The GDP scenario may be valid for some countries, but depend on stable political conditions and satisfactory capacity and operational conditions.

Passenger transports show a slower growth than freight transports, at an annual rate of 1,6% from 1990 to 2005, -which is slightly lower than the corresponding population growth. As for freight transports, there are huge variations among the countries. The fastest growing country is Iran (+5,4% per year). Turnkey has been declining during the period from 1990 to 2006 by 1.6% per year.

A linear trend, based on the history from 1990 to 2005, concludes with a slightly higher transportation volume in 2025, while a scenario based on the expected population growth, shows 50% more passenger transports in 2025 compared with 2005.

10.2 Infrastructure requirements

The Middle East's railway density (routekm. per km²) is approximately one to fourteen (1/14) of the densities found in the EU. The density measured as routekm. per capita is one fifth (1/5) of Europe's. A huge share of the Middle East railway network is of bad standard due to lack of investments and maintenance. In some countries the railway infrastructure is more or less damaged and abandoned due to conflicts and civil wars.

Huge infrastructure investments are required to meet the demand for transport in the Middle East. Missing links have to be completed if international corridors shall be operational. The level of investment is beyond the capabilities of many of the state owned railways or the public sector as a whole.

The railway route network of the Middle East is per 2007 approximately 23.000 kilometers. If the railway network is to be developed according to projected economic growth, close to 30.000 km has to be constructed within 2025. The 2025 network should be 2-2.5 times the 2006 level (figure below). However, capacity is a comprehensive concept and additional volumes can also be handled by upgrading existing lines, some new links and improving operational conditions.

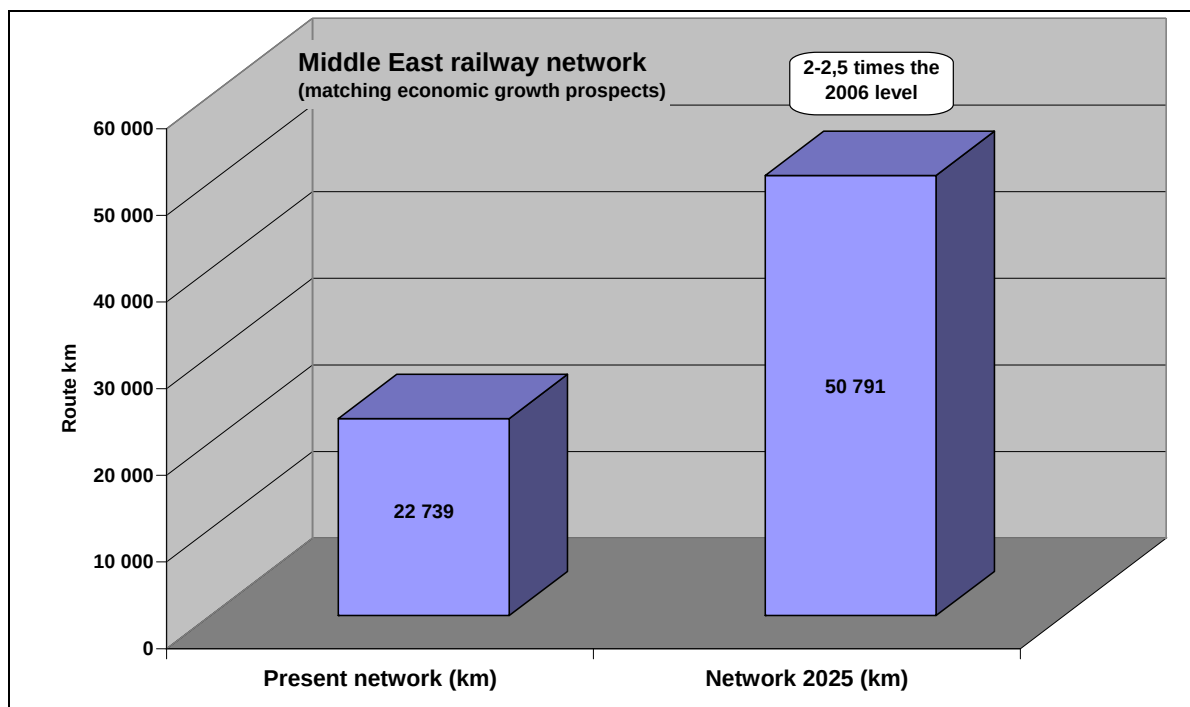


Figure 10-2: Investments matching economic growth

Figure 10-2 shows only investments in additional tracks, not the investments required to improve the quality of the existing network.

Furthermore, it is reasonable to believe that the track-density in the Middle East is lower than required to satisfy the potential market. The average track density per 1 million inhabitants in the Middle East is 88 kilometers, while the average of EU-25 is 486 kilometers.

Bringing the Middle East average up to the EU average requires new investments of 90.000 kilometers of tracks, which gives a total network of 5 times the present level.

It is projected that more than 80 million additional inhabitants, belonging to the railway countries of the Middle East, may require passenger transports in 2025 compared with the present situation, and that the real demand for passenger transport services may even be higher, due to increased buying power.

If the Middle East railways should offer the same track-density (track per 1 million inhabitants) as the average of EU-25 (immediate investments) and further develop according to the population growth prospects, the blue line in the figure below shows an indication of how the network should expand. The immediate investments are 90.000 kilometers and additional 37.000 in 2025, totaling a network of 150.000 kilometers in 2025.

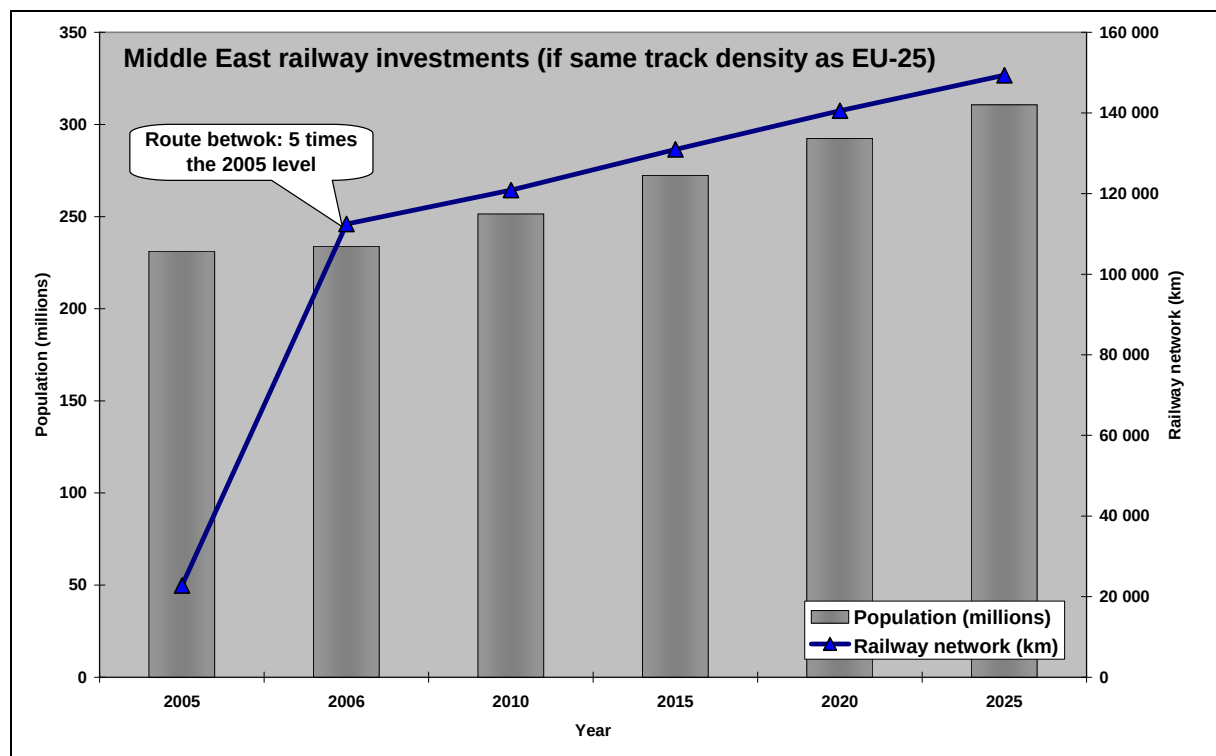


Figure 10-3: Investments matching EU network and population growth

The illustrations above are of course simplifications of the reality, -but still an indication of huge investment requirements. This level of investments depends of course on funding opportunities as well as the ambitions/goals for the Middle East railways and the general investment climate.

The present situation is that share of railway transport along the trade lane Europe, Middle-East and Asia is low due to various infrastructure deficiencies, bottlenecks etc. When the East-West corridor through the Middle East comes into viable commercial operation it is believed that the transportation route will offer fast transit times, low cost as well as other advantages. Projects like the Marmaray will contribute to more seamless international transportation. Such projects are tools capturing a larger share of the huge market potential. Making infrastructure investment in one country will usually be a benefit for the entire region when it comes to international trade.

11 The way forward

The Vision document is a start-up document for UIC's work in the Middle East. It is still work to do and several issues have to be looked closer into. A positive development is possible, and there are successful improvements in many countries and regions. UIC's focus is the entire Middle East and the Middle East railways. UIC intends to participate on the country level, regional level and on the master plan level.

Even though future is insecure, it is our vision that the demand for transports in the Middle East will grow and that a larger market share will be captured by environmental friendly railways, when railways supply side (railway service) and operational conditions improve. To some extent, and for some countries, the growth can be considerable, - both for passenger- and freight transport.

UIC, and UIC's regional unit in the Middle East, intends to be important contributors to the development of railways in the Middle East.

The recommendation for UIC's next step is to put effort in the development of a more detailed action plan for the Middle East railways, based on a common vision. Main development areas should be identified. The work should emphasize the process where members are involved as well as other organizations.

Development of the Middle East railways depends on the demand for railway transports, the entire railway service (supply side), external conditions and the work of organizations like UIC.

Identifying demand

The potential future demand for railway transports on specific Middle East routes should be identified more clearly, as market demand is the basic condition for investments and development of the railway services. This could be done through for instance specific origin-destination (O/D) analysis.

Developing the railways supply side (railway service)

A strategic description of the Middle East railways supply side (including various products and corridors), -based on accepted commercial and logistical criteria's, and focusing on segments where the railways is believed to have strong competitive advantages.

The supply side can (but not always) be influenced by the railways themselves and this work should be emphasized by UIC Middle East. Such factors, which strongly influence the supply side, are for instance:

- o The Logistical operation including equipment and procedures
- o Logistical chains and intermodality/interoperability like effective port/terminal operation
- o Modal and logistical cooperation, like cooperation with ports, shipping lines etc
- o The financial operation and management control systems
- o Development of human resources, organizational development and training of personnel
- o Security standards
- o Customer support and information systems (marketing, tracing etc)
- o Etc

Corridor development

There should be a strong focus on corridor development, including port-hinterland corridors, transit corridors and the connections/synergies between such corridors. The Middle East region has several potential corridor projects; like the North-South Corridor, East-West connections through Marmaray, various intermodale connection as well as potential international railways routes. Corridor development requires strong regional/international cooperation, effective Hub- and terminal structures etc.

Influencing policy makers

The Middle East has no general and accepted transport policy for the railways. Several external organizations and policy makers influences the conditions for railways transport. Such conditions may

include issues where the railways and UIC have little or no influence on (like interest rates, population growth etc), but also conditions where it is possible to influence policy makers like international organizations and national governments. For example:

- o Preparing for professional inputs regarding the investments (infrastructure as well as maintenance) required by the Middle East railways
- o Preparing professional analysis regarding potential corridors (including transit corridors), how to improve interoperability and transparency, and showing the benefits of developing railway links and corridors
- o Preparing analysis and information concerning the railways contribution to sustainable development of the Middle East transportation sector
- o Proposing plans for closer cooperation and integration among the railways (which may require assistance from more than one government).
- o Etc

A strong political will is required to develop the railways of the Middle East and their connections. UIC intends to participate in the work, - on the international, national-, and at the corridor level.

Developing the organizational matters for UIC Middle East

Most of the railway nations of Middle East are active members of UIC Capitalizing the growth prospects in these UIC countries are not only depending on well-functioning port connections, but also well-functioning inland connections and corridors. Through the new UIC, these countries should be encouraged to work through UIC and the development of strategic action plans for the region.

Important issues are related to the development of organizational matters for UIC's the regional unit of the Middle East as well as a plan for implementation and how to secure continuity.

The recommendation for UIC's next step next is to develop a strategic plan/action plan for the Middle East railways based on principle discussions in UIC and among the respective members. The work should emphasize the process where members are involved. During the process, where some tasks may take several years, at least the following goals may be obtained for the Middle East Railways:

- An acceptance of a common visions and goals
- Identifying some main common development areas
- Specific strategies related to the huge investments required by the Middle East railways, as well as plans for closer cooperation, integration and how to influence policy makers.
- A strategic description of the Middle East railways' supply side (various products and corridors), -based on commercial criteria and their competitive advantages.
- Development of a membership strategy, organizational matters and a plan for implementation and how to secure continuity

12 Enclosures

I. Countries defined as Middle East

"Railway countries" (8)		"No-railways" (6)	
1	Iran	9	Bahrain
2	Iraq	10	Kuwait
3	Israel	11	Oman
4	Saudi Arabia	12	Qatar
5	Syria	13	United Arab Emirates
6	Turkey	14	Yemen
7	Jordan		
8	Lebanon		

Note: Active UIC members, June 2007