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**TRANSPORT FOR SUSTAINABLE DEVELOPMENT IN THE
ARAB REGION: MEASURES, PROGRESS ACHIEVED,
CHALLENGES AND POLICY FRAMEWORK**



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CONTENTS

	<i>Page</i>
Introduction.....	1
<i>Chapter</i>	
I. TRANSPORT AND SUSTAINABLE DEVELOPMENT IN THE ARAB REGION.....	3
A. Background.....	3
B. Transport and sustainable development pillars.....	3
C. The Arab transport sector: structure and sustainability.....	6
II. SUSTAINABLE TRANSPORT MEASURES AND PRIORITY OPTIONS FOR THE ARAB REGION.....	10
A. Policies and measures to improve management of the transport sector.....	10
B. Adopting advanced transport technologies.....	13
C. Improving fuel specifications.....	14
D. Promoting road networks and rural transportation.....	15
E. Promoting safe transport.....	15
F. Adopting standards regulation and institutional frameworks.....	16
III. PROGRESS ACHIEVED ON SUSTAINABLE TRANSPORT IN THE ARAB REGION.....	19
A. Policies and measures for improving management of the transport sector.....	19
B. Adopting advanced transport technologies.....	21
C. Improving fuel specifications.....	22
D. Promoting road networks and rural transportation.....	23
E. Promoting safe transport.....	24
F. Adopting standards, regulations and institutional frameworks.....	25
G. Galvanizing the political will.....	28
IV. TRANSPORT FOR SUSTAINABLE DEVELOPMENT IN THE ARAB REGION, CHALLENGES AND POLICY FRAMEWORK.....	30
A. Challenges.....	30
B. Priority areas for action.....	32

CONTENTS *(continued)*

Page

LIST OF TABLES

1.	Per capita fuel consumption and CO ₂ emission in road transport, gasoline and diesel oil, in selected Arab countries (2005)	9
2.	Growth in transport sector energy demand in the ESCWA region, 1995-2020	9
3.	Ranking of sustainable transport barriers in some Arab countries	30

LIST OF FIGURES

I.	Distribution of fuel consumption in road transport, gasoline and diesel oil, in the Arab countries (excluding Comoros, Somalia, Western Sahara, Djibouti and Mauritania) (2005).....	8
II.	Priority options for promoting sustainable transport in the Arab region.	11

Introduction

Transport is crucial for achieving economic growth and trade at national, regional and global levels as well as for facilitating a wide variety of public and social services. Meanwhile, lack of access to safe and effective transport together with population growth and rapid urbanization constrain development in many developing countries, including the Arab countries. Historically, the development of the transport sector in a given country has been an indicator for its economic welfare and success. It is probably the largest sector in the world, in terms of financial turnover, workforce, and resource use. The direct value added by the transport sector to the global gross domestic (GDP) is about 3-5 per cent, and transport directly provides 5-8 per cent of total paid employment of an average country.¹

It is due to the above and the fact that patterns of transportation development prevailing during the last two decades were not sustainable and associated with both environmental and health problems, the international community has been paying attention to the transport sector and its sustainability, which was also addressed in several chapters in the Agenda 21 international plan of action to sustainable development for the 21 century, issued by the United Nations Conference on Environment and Development (UNCED) in 1992.² The United Nations Commission on Sustainable Development (CSD) in its ninth special session in 2001 (CSD-9) conducted a five-year review of the implementation of Agenda 21 and noted that transportation is expected to be the major driving force behind a growing world demand for energy. It is the largest end-use of energy in developed countries.³ Furthermore, the need for more sustainable transport systems was emphasized by the Johannesburg Plan of Implementation (JPOI) issued by the World Summit on Sustainable Development (WSSD), where countries agreed to promote an integrated approach to transport policymaking, including policies for land use, infrastructure, public transport systems and goods delivery networks, with a view to providing safe, affordable and efficient transportation, increasing energy efficiency, reducing pollution, reducing congestion, reducing adverse health effects and limiting urban expansion.

The upcoming two-year cycle of CSD-18 and CSD-19 for 2010-2011 will focus on five thematic areas: transport, chemicals, waste management, mining, and the ten-year framework of programmes on sustainable consumption and production (SCP). CSD-18 to be held during 3-14 May 2010 will review the progress achieved and identify challenges, barriers and gaps in the implementation of the commitments and goals specified in Agenda 21 and JPOI relevant to the five CSD-18/19 thematic areas, while CSD-19 to be held in 2011 will discuss the recommended policies and measures for the same thematic areas.

The preparations of the Arab region for the CSD cycles are lead by the strategic partnership among the Economic and Social Commission for Western Asia (ESCWA), the League of Arab States and the Regional Office for Western Asia of the United Nations Environmental Programme (UNEP/ROWA). Within the framework of preparation for CSD-18, ESCWA has been tasked to prepare a report on the transport thematic area putting focus on the regional assessment of the progress achieved, challenges, policies and priority area of action. In addition, ESCWA was also tasked to consolidate a draft for the Arab Region Implementation Report with respect to the five thematic areas. The Report was submitted to and discussed in the Joint Committee on Environment and Development in the Arab Region (JCEDAR), which was held in Cairo from 4 to 6 October 2009.

In connection to the above, ESCWA prepared a questionnaire on sustainable transport and sent it to the authorities concerned in the Arab countries. Ten countries, namely Bahrain, Egypt, Jordan, Lebanon, Oman, Palestine, Qatar, Saudi Arabia, the Sudan and the Syrian Arab Republic responded to the questionnaire. The data received were analysed and a literature review was conducted to complement the

¹ *The Role of the Transport Sector in Environmental Protection*, background paper no. 15, Department of Economic and Social Affairs, Commission on Sustainable Development, ninth session, 16-27 April 2001, New York.

² See: http://www.un.org/esa/dsd/agenda21/res_agenda21_09.shtml.

³ Ibid.

information and data requested for the subject report, which is structured in four chapters dedicated to the following subjects:

Chapter I, Transport and Sustainable Development in the Arab Region, presents an overview of the possible role of the transport sector in achieving sustainable development and combating climate change. It also spotlights the status of the transport sector in the Arab region with particular focus on its structure, energy consumption and sustainability issues, in particular greenhouse gas emissions.

Chapter II, Sustainable Transport Measures and Priority Options for the Arab Region, reviews the development measures and means for achieving sustainable transport and identifies a number of options that can help realize sustainable transport in the Arab region. These options fall into six categories: policies and measures for improving management of the transport sector, adopting advanced transport technologies; improving fuel specifications; promoting road networks and rural transportation; promoting safe transport; and adopting standards, regulation and institutional frameworks.

Chapter III, Progress Achieved on Sustainable Transport in the Arab Region, overviews and discusses the achievements of the Arab countries in the identified priority options. The chapter focuses on the regional achievements with key examples from some Arab countries. In addition, the chapter spotlights the declarations issued by Arab leaders and ministerial councils concerned in support to sustainable development, including those on transport.

Chapter VI, Transport for Sustainable Development in the Arab Region, Challenges and Policy Framework, discusses the challenges arising during the move towards promoting a sustainable transport sector in the respective countries. It also identifies a set of priority areas for action to improve sustainability of the transport sector in the region.

I. TRANSPORT AND SUSTAINABLE DEVELOPMENT IN THE ARAB REGION

A. BACKGROUND

Since the UNCED in 1992, the world is targeting to achieve development through sustainable processes that take into account all the economic, social and environmental aspects of development. Agenda 21, issued at the UNCED, and the JPoI, endorsed at the WSSD, have identified policies and measures for achieving sustainability in different sectors, including the transport sector, and requested countries to devote efforts to the implementation of such policies and measures.

Transport is very essential for the economic and social development of all countries as well as for supporting regional and global cooperation and economies. However, poor transport, and lack of access to safe and effective transport, constrain development in many developing countries, especially the least developed countries. These problems are exacerbated by population growth and urbanization.

Sustainable transport was defined by the World Business Council for Sustainable Development as: the ability to meet society's need to move freely, gain access, communicate, trade, and establish relationships without sacrificing other essential human or ecological values, today or in the future.

Improving transport systems and access to transport, in accordance with the principles of sustainable development, can foster economic and social development, assist in the integration of developing countries into the world economy and contribute to the eradication of poverty.

Between 1950 and 1990, the number of motorized road vehicles in the world grew by roughly nine times, from about 75 million to about 675 million. During the same period, the world population doubled, from some 2.5 billion to near 5.0 billion. Likewise it is reported that, over the past 50 years, the transport sector was the most growing one in industrialized countries.^{4,5}

Over the next 35 years, 2.5 billion people will be added to the current world population of over 6.5 billion. The United Nations predicts that more than 80 per cent of population growth in the next ten years will occur in the urban areas of developing countries.⁶ The number of cities exceeding one million inhabitants is expected to increase from 268 in 2000 to 358 by 2015.⁷ This growth, coupled with continuing globalization and trade liberalization, is expected to significantly accelerate the demand for the transportation of both people and goods. The predicted road transport growth to 2030 is driven largely by increased demand for mobility in developing countries, where annual growth rates are predicted to average 2.8 per cent.

In view of the above, this chapter discusses the role of the transport sector regarding the three pillars of sustainable development and spotlights the status, structure and sustainability of the Arab transport sector.

B. TRANSPORT AND SUSTAINABLE DEVELOPMENT PILLARS

1. *Transport and economic development*

Transport is crucial for economic growth and trade, both of which are highly dependent on the transportation of people and goods. Almost no production can take place unless such inputs as raw materials,

⁴ See: <http://www.oecd.org/dataoecd/28/54/2396815.pdf>.

⁵ Adapted from Tolley, R. and Turton, B. 1995. *Transport Systems, Policy and Planning: A Geographical Approach*. Harlow, Essex: Longman Scientific & Technical. P. 268.

⁶ See: <http://earthtrends.wri.org/updates/node/135>.

⁷ See: <http://web.worldbank.org/WBSITE/EXTERNAL/NEWS/0,,contentMDK:21517582~menuPK:34480~pagePK:64257043~piPK:437376~theSitePK:4607,00.html>.

labor, and fuel can be moved from different locations; neither can manufactured products be delivered to consumers nor a wide variety of services carried out.

Historically, the development of a country's transport sector has been an indicator for its economic welfare and success, and ownership of a car and leisure travel can be even status symbols. The transport sector includes automotive industry, aircraft construction and operation industry, train construction and railway operation and the ship building and operation industry and their suppliers. Globally speaking, it is probably the largest sector in the world, in terms of financial turnover, workforce, and resource use. The direct value added by the transport sector to the global GDP is about 3-5 per cent, and transport directly provides 5-8 per cent of a typical country's total paid employment.⁸

Upgrading and improving sustainability of the transport sector can achieve a set of economic benefits, particularly those related to employment opportunities. For example, more than 3.8 million new jobs could be available globally through the increased production of low emission vehicles. Up to 19 million additional ancillary jobs worldwide could be available in fuel refining and distribution, sales, repairs, and services. Investment in clean and efficient public urban transit transport also contributes secondary employment effects, with a multiplier of 2.5 to 4.1 per direct job. In the United States, for example, a ten-year federal investment programme in new high-speed rail systems has the potential of generating 250,000 jobs.⁹ In the Republic of Korea, US\$7 billion to be invested in mass transit and railways over the next three years is expected to generate 138,000 jobs.¹⁰ Public urban transit systems have significant direct employment impacts globally, accounting for 367,000 workers in the United States and 900,000 in the European Union alone.¹¹

Yet, non-sustainable transport also has negative economic consequences, for example:¹² the economic cost of traffic congestion has reached over 3 per cent of GDP in many cities; urban road accidents cost developing countries US\$65 billion each year; in the most heavily polluted cities, economic losses from air pollution reach 10 per cent of GDP; and non-sustainable transport contributes to climate change, and the poorest countries losses due to climate change is estimated by 5-9 per cent of their total GDP.

2. Sustainable transport and social development

Transport impacts on people's quality of life in many ways. The negative impacts are often obvious and can be very significant for the environment and people's well-being. They include air pollution, noise and vibration caused by road, rail and air traffic, the loss of wildlife habitats and countryside, the visual intrusiveness of roads and railways, and oil-spills on beaches.¹³ These impacts occur at all levels of the life cycle of vehicles (passenger cars, busses, trucks and trains) and include vehicle production, operation and discarding.

Meanwhile, as explained above, the measures for achieving sustainable transport, when applied, can create a large number of job opportunities and help upgrade the quality of life of vulnerable groups. In addition, extending transport services to poor rural communities can facilitate the establishment of rural on

⁸ *The Role of the Transport Sector in Environmental Protection*, background paper no. 15, Department of Economic and Social Affairs (DESA), CSD-9, 16-27 April 2001, New York.

⁹ Bezdek, R. H. and Wendling, R. M. 2005. Potential long-term impacts of changes in US vehicle fuel efficiency standards. *Energy Policy*. 33: 407-419; and Renner, Sweeney and Kubit. 2008, and Zhao, Jimin. 2006. Whither the Car? China's Automobile Industry and Cleaner Vehicle Technologies. *Development and Change*. 37 (1): 121-144.

¹⁰ UNEP/G.R.I.D. 16 February 2009. Realizing a "Green New Deal". Arendal. Available at: <http://www.grida.no/news/press/3469.aspx>.

¹¹ UNEP. *Global Green New Deal – A Policy Brief*. March 2009.

¹² See: <http://earthtrends.wri.org/updates/node/135>.

¹³ *The Role of the Transport Sector in Environmental Protection*, background paper no. 15, DESA.

site production activities and the transportation of agriculture products to the market to increase rural income.

3. *Sustainable transport and environmental issues*

Transport-related activities have wide-ranging and far-reaching environmental impacts on natural resources, including air pollution, water pollution and impacts on land. In addition, they also contribute to global warming and climate change as well as such other effects as local noise pollution and congestion, as well as a range of public health problems. The following summarizes such impacts:

(a) *Air pollution and climate change.* All modes of transport produce emissions from the combustion and/or the evaporation of fuels. These emissions include carbon monoxide (CO), hydrocarbons (HC), oxides of nitrogen (NO_x), particulate matter, lead and CO₂, as well as chlorofluorocarbons (CFCs), which are released during vehicle manufacture and disposal.

The unabated increase in motorized transport and the concentration of vehicles in urban areas has seriously affected the air quality in several cities in the Arab region. It is expected, however, that provision of wide streets, reasonably fast-flowing traffic, well-developed traffic plans and automated traffic control, and the introduction of unleaded gasoline in most of the ESCWA member States will help to reduce the impact of vehicle-generated pollution. The pollutants emitted during transport activities have a variety of environmental impacts, inter alia, global warming, acid rain, chronic health problems and damage to vegetation.

Transport is responsible for about one quarter of the current energy use worldwide. Transport is heavily dependent on fossil fuels, it accounts for about half of the global oil demand. Since 1970, transportation energy demand has grown by 110 per cent, worth about 18 million barrels of oil per day, and according to projections by the United States Department of Energy, it will grow another 77 per cent, worth about 27 million barrels oil per day, by 2020. Transportation energy use in developing countries has been increasing at over 4 per cent year over the past 20 years, far exceeding the global 2.7 per cent of increase. Since almost all transportation energy sources are in the form of petroleum products, increases in transportation energy use translate into large carbon emissions increases. Coupled with rapid urbanization, transport related emissions from urban areas are set to rise significantly.

Globally, transport accounts for 13 per cent of the total greenhouse gas and 23 per cent of energy related CO₂ emissions. By 2050, the International Transport Forum within the Organisation for Economic Co-operation and Development predicts a 120 per cent growth of global transport emissions on 2000 levels.

In the Arab region, the transport sector accounts for 22 per cent of the total greenhouse gas emissions, of which 85 per cent is attributed to in-land transportation. The most harmful impact of the transport sector comes from the daily use of vehicles, as it consumes about 66 per cent of the total vehicle energy consumption from manufacturing to scraping, while the manufacturing process and scraping consumes about 34 per cent.¹⁴ Moreover, the energy used in the daily operation of vehicles has only about 12 per cent useful energy, transmitted to wheels.

Therefore, without tackling transport at international and regional levels, average global temperature rise cannot be limited to two degrees Celsius and climate change will not be combated.

Despite the fact that the Arab region was historically the lowest contributor to global warming, scientific projections indicate with a high degree of confidence that the region will be heavily affected by climate change. Based on information revealed by the Intergovernmental Panel on Climate Change (IPCC) in

¹⁴ Environment 2007 – International Conference on Integrated Sustainable Energy Resources in the Arid Regions, 28 January to 1 February 2007, Abu Dhabi.

its fourth report, the Arab region is bound to suffer from the rise in sea level and large parts of the most fertile agriculture lands of the Nile Delta in Egypt and the Shat Al Arab in Iraq will be inundated. The Arab region will also suffer from reduced precipitation on the Mediterranean basin and on upstream countries supplying most of the renewable freshwater to the region.

Not only the transport sector has its impacts on climate change, but climate change would also affect the transport sector. From a physical perspective, climate change is likely to lead to both challenges and new opportunities for transportation systems.¹⁵

- High winds may affect the safety of air, sea and land transport, whereas intense rainfall can also adversely influence road safety;
- There is likely to be an increased use of air conditioning, particularly in private vehicles;
- Higher temperatures can damage rail and road surfaces and affect passenger comfort;
- Rising sea level and wetter winters can increase flooding and in particular flash flooding during winter caused by higher tides, rivers and urban drains, which, in turn, will cause flooding of rail systems and roads.

(b) *Water pollution.* Runoff of water from roads pollutes surface water and ground water, and natural waterways are often modified in the course of road building. The environmental impact of railroads is limited to the release of oil and grease from trains, and the leakage of creosote from track beds. Aviation-related environmental impacts may arise from the construction of airports, which often involves modification of water tables, the course of rivers and field drainage, and the contamination of nearby water sources by de-icing chemicals and degreasers. Maritime activity can create environmental problems through the discharge of ballast wash, the modification of water systems during port construction, canal cutting and dredging, sanitation discharges, and, in the event of an accident at sea, environmentally devastating oil spills.

(c) *Impact on land resources.* Land resources are affected by a number of such transport-related activities as the development of infrastructure, the construction of terminals, the extraction of road-building materials, and the disposal of rubble from road works, road vehicles withdrawn from service, waste oil, tyres and batteries.

(d) *Health effects:* Transport pollutants, including carbon dioxide (CO₂) and monoxide (CO), nitrogen dioxides (NO₂), nitrogen oxides (NO_x), sulfur dioxide (SO₂), volatile organic compounds (VOC), particulate matter, aldehydes, benzene and lead cause multiple and severe health problems. Such pollutants are linked to an estimated 500,000 deaths, 4-5 million new cases of chronic bronchitis as well as millions of cases of other serious illnesses each year worldwide. The economic burden of this pollution is estimated at US\$150-750 billion per year.

C. THE ARAB TRANSPORT SECTOR: STRUCTURE AND SUSTAINABILITY

The transport sector plays a major role in the economic and social development of the Arab countries. Although it effectively contributes to the welfare of countries in the region by facilitating economic activities and trade, the demand in the sector is likely to increase faster than the GDP as a result of population movement from rural areas to cities, the movement of increasing quantities of goods within and between countries, and the fact that motor vehicle ownership is growing at a faster pace than road transport infrastructure in urban areas.¹⁶

¹⁵ Department for Transport. *The changing climate: its impact on the Department for Transport*. United Kingdom.

¹⁶ *Transport and Sustainable Development in the ESCWA Region*, background paper no. 8, CSD-9, 16-27 April 2001, New York.

1. *The structure of the Arab transport sector*

The transport sector in the Arab region has significantly progressed during the past two decades. In 2008, the total number of vehicles in the Arab region, excluding motorcycles, reached about 26.7 million motor vehicles, with an average annual growth rate of 4.2 per cent during 1997-2008, exceeding the predicted average annual growth rates for developing countries of 2.8 per cent.¹⁷ Passenger cars in the Arab countries represent about 60 per cent of total road transport fleet, while trucks and buses represent about 28 per cent and 3 per cent, respectively.¹⁸

There is a considerable diversity in the structure of the transport sector among Arab countries, particularly in relation to the size of the national vehicle fleet, the relative penetration of various modes of transport, and the quality of infrastructure serving the sector. In 2008, the average population per vehicle, capita per vehicle, in the region was 11.1, with a considerable diversity among countries, as it varies from 1.8 in Qatar, to 28.1 in Egypt, to 52.6 in the Sudan.¹⁹

While railways, maritime and air transportation are major sectors, vehicles used for in-land transportation remain one of the major fuel consumers in the Arab transport sector. Railway transport systems are available in a limited number of Arab countries, especially in Egypt, Iraq, Saudi Arabia, the Sudan and the Syrian Arab Republic. The gross tonnage of the commercial marine fleets in the ESCWA member countries amounted to 6,664 tons in 2006, with the largest shares in Kuwait and Saudi Arabia.

Traffic congestion is a growing problem in the Arab region due to a large increase in the volume of traffic in recent years, in particular in cities with more than one million inhabitants, such as Baghdad, Beirut, Cairo, and Damascus. Subsidized gasoline prices in most Arab member States, low utilization of public transport (either as a result of a preference for private vehicle use or a lack of effective public transport) and an ageing, highly polluting vehicle fleet, all contribute to traffic congestion and higher levels of energy consumption, which aggravate pollution problems locally as well as globally.

In most Arab States, there are a number of characteristics that are common to each country's transport sector and which can affect the possibilities for achieving sustainability in the sector. These common characteristics include the following:

(a) *Age of the national vehicle fleet:* Vehicles in most countries in the region, with the exception of the Gulf Cooperation Council (GCC) countries, tend to be old, with high fuel consumption and low efficiency. It is not unusual to find that more than 70 per cent of the light-duty vehicle fleet in a developing country does not receive regular maintenance or diagnostic testing, and has an average age of about 15 years.²⁰

(b) *Modes of traffic management:* In the region, and in many cases, traffic management modes do not facilitate smooth traffic flow, and limited public awareness of appropriate traffic procedures leads to limited control of public behaviour. In such cities with particularly heavy traffic as Baghdad, Cairo and Damascus, there is a need to update traffic regulations;

(c) *Limited penetration of public transport:* The most frequently used mode of transport in the Arab countries is the private car, a situation that aggravates problems of congestion, travel delay and pollution;

¹⁷ See: <http://unfccc.int/resource/docs/2009/smsn/igo/045.pdf>.

¹⁸ Questionnaire filled by ESCWA member countries (2009); and various issues of the Statistical Abstract of the ESCWA Region.

¹⁹ Questionnaire filled by ESCWA member countries (2009); and estimations based on growth rate during 1997-2008.

²⁰ *Global Transport and Energy Development: The Scope for Change*. 1998. London: World Energy Council.

(d) *Lack of relevant standards and regulations:* Environmental standards and regulations relating to the transport sector are either non-existent or not sufficiently enforced;

(e) *Extensive natural gas resource:* The Arab region has enormous natural gas resources. For economic and environmental reasons, local natural gas consumption in the transport sector can be encouraged by making it available at reasonable prices;

(f) *Transport sustainability:* In spite of the efforts devoted in the Arab region to achieve transport sustainability, the current practiced energy efficiencies in land transport need improvement and have not reached their potential.

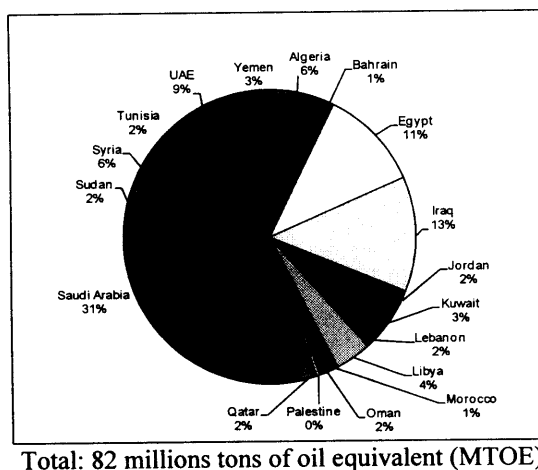
2. Arab transport sector sustainability

Rapid urbanization requires proportional development of transportation systems and the expansion of associated infrastructure, which is dependent upon energy accessibility and usage. Motorized urban transport accounts for a large share of energy consumption in cities. The UN-HABITAT Global Urban Observatory states that, for cities in the Middle East, private motorized transportation modes are the main contributors to the CO₂ emissions in the transport sector. Therefore, any policy aimed at mitigating the effects of climate change must list motorized urban transport among its priorities. In principle, reducing CO₂ emissions from the transport sector is much easier than cutting those from the building sector, according to UN-HABITAT.

In the Arab region, the transport sector accounts for 22 per cent of the total greenhouse gas emissions of the Arab region, of which 85 per cent is attributed to in-land transportation. Except in the Gulf States, vehicles are on average over 15 years old and are often not maintained on a regular basis. The use of public transportation is limited. The adoption and enforcement of environmental standards and specifications is also limited to vehicle licensing and inspection. There is also a need to improve road traffic management.

The total gasoline and diesel oil consumption in road transport in 2005 in the Arab region, excluding Comoros, Djibouti, Mauritania, Somalia and Western Sahara, reached about 82 millions tons of oil equivalent, and CO₂ emission reached about 258.4 million tons. Saudi Arabia represented about 31 per cent of fuel consumption in road traffic in Arab countries and Iraq about 13 per cent, while Morocco only represented 1 per cent, as shown in figure I. Fuel consumption in road transport, gasoline and diesel oil, in 2005 represented about 51 per cent from total final oil consumption in the Arab region, and generally ranged between 13 per cent (in Morocco) and 92 per cent (in Bahrain). The average per capita fuel consumption in the transport sector in the Arab region in 2005 was about 0.27 tons, and average per capita emission of CO₂ was 0.82 tons, with a considerable variety in these values among Arab countries, as shown in table 1.²¹

Figure I. Distribution of fuel consumption in road transport, gasoline and diesel oil, in the Arab countries, excluding Comoros, Djibouti, Mauritania, Somalia and Western Sahara (2005)



²¹ Energy Statistics of Non-OECD Countries, 2008 Edition. International Energy Agency (IEA) Statistics.

TABLE 1. PER CAPITA FUEL CONSUMPTION AND CO₂ EMISSION IN ROAD TRANSPORT, GASOLINE AND DIESEL OIL, IN SELECTED ARAB COUNTRIES (2005)

Country	Fuel consumption (tons of oil equivalent/capita)	CO ₂ Emission (tons of oil equivalent/capita)
United Arab Emirates	1.87	5.44
Qatar	1.39	4.06
Libyan Arab Jamahiriya	0.57	1.68
Oman	0.51	1.44
Jordan	0.30	0.88
Tunisia	0.17	0.50
The Sudan	0.05	0.15
Morocco	0.01	0.41
Average Arab country	0.27	0.82

The total energy use for transportation would increase by more than 55 per cent between 1995 and 2020 worldwide,²² averaging 1.8 per cent growth a year. In the Arab region, for the same period, a similar growth rate has been adopted (see table 2).

TABLE 2. GROWTH IN TRANSPORT SECTOR ENERGY DEMAND IN THE ESCWA REGION, 1995-2020

	Light-duty vehicles	Aviation	Road freight	Rail	Total	Total energy demand for transport worldwide
1995						
Total (MTOE)	4.0	2.5	27.5	0.5	34.5	1918.0
Percentage of total	11.6	7.3	79.7	1.5	100.0	100.0
2020						
Total (MTOE)	11.0	6.5	36.5	0.5	54.5	2997.0
Percentage of total	20.2	11.2	67.0	0.9	100.0	100.0
Annual growth (percentage)	3.8	3.6	1.2	0.0	1.8	1.8

Source: *Towards Harmonization of Environmental Standards in the Energy Sector of ESCWA Member States*, (E/ESCWA/ENR/1999/21). ESCWA 1999, p. 58; and figures for worldwide transport energy demand provided by the World Energy Council in *Global Transport and Energy Development: The Scope for Change*, 1998, London. P. 14.

Note: Figures may not add up to 100 per cent due to rounding.

Taking note of the above and the fact that growth in transport demand poses several implications on sustainable development, countries in the region have devoted efforts towards promoting transport sector sustainability through adopting different policies and measures that are described in chapters II and III.

²² *Global Transport and Energy Development: The Scope for Change*. 1998. London: World Energy Council.

II. SUSTAINABLE TRANSPORT MEASURES AND PRIORITY OPTIONS FOR THE ARAB REGION

Enhancing the sustainability of the transport sector is a real challenge because of the unique role of the sector in the social and economic development and the wide spectrum of transport stakeholders, including private and commercial transport users, manufacturers of vehicles, suppliers of fuels, builders of roads, planners, and transport service providers. Policies and measures to promote transport sustainability often challenge the interests of one or another of these groups and run the risk of failure unless they take account of stakeholder concerns and meet transport needs of the population.

In the Arab region, each member State has its own particular circumstances, which determine how it might best handle the issue of promoting sustainable transport. However, on the basis of existing economic and technical capabilities in the region, the transport sector development status, characteristics and experiences, studies have identified six groups of policies, measures and actions that are considered as priority options for achieving sustainable transport in the region. These priority options are:

- (a) Policies and measures for improving management of the transport sector;
- (b) Adopting advanced transport technologies;
- (c) Improving fuel specification – gasoline and diesel;
- (d) Promoting road networks and rural transportation;
- (e) Promoting safe transport;
- (f) Adopting standards, regulation and institutional frameworks.

Figure II shows the classification of these options, which are further discussed in this chapter.

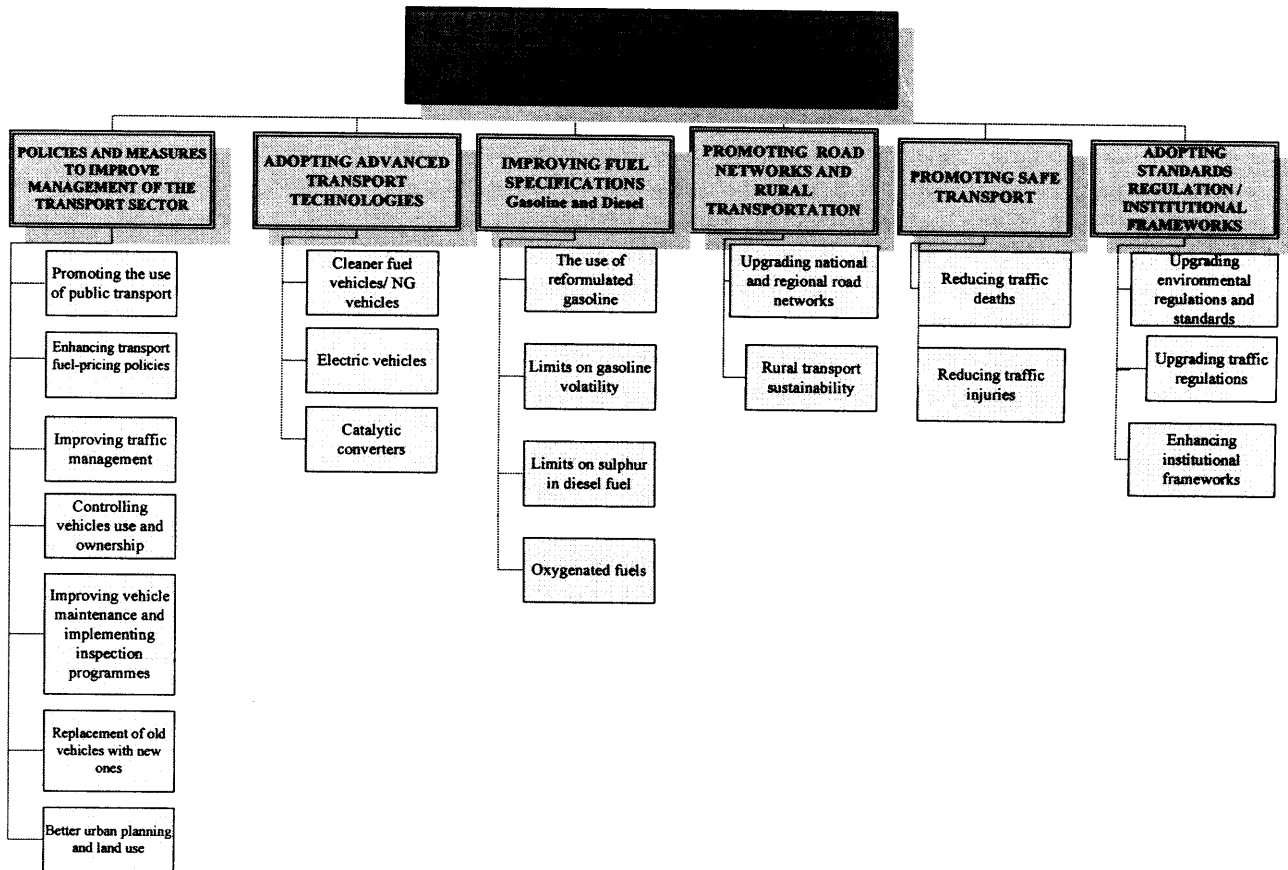
A. POLICIES AND MEASURES TO IMPROVE MANAGEMENT OF THE TRANSPORT SECTOR

1. *Promoting the use of public transport*

Public transport is a key point within a well-planned and integrated transportation system adapted to local needs for sustainable transport. Use of public transit and ride sharing not only reduce pollution, but also save money for commuters and Governments alike. Public transportation is an efficient mode of transport, occupying much less road space and using less fuel per passenger than cars, thereby generating less pollution per passenger kilometer (km). Using buses instead of passenger cars decreases emissions per passenger km of CO₂, NO_x, CO, and HC by 3.6, 3.0, 19.2, and 10.2 times, respectively.²³ The use of rail transport or ships instead of trucks to move freight magnifies those benefits. The specific energy consumption (fuel consumption/ton-km) for trucks in Egypt is 4.9-6.2 times that of trains.²⁴

²³ *Transport Statistics 1978-1988*. United Kingdom Department of Transport. 1989. London: Her Majesty's Stationery Office.

²⁴ *Electrification of Egypt's railway*. Organization for Energy Planning. September 1999.



2. Enhancing transport fuel-pricing policies

Higher fuel prices encourage automobile buyers to choose cars that provide better fuel efficiency. Higher fuel prices may also discourage unnecessary use of vehicles in the long term by prompting such structural changes as lifestyle or urban planning decisions that reduce the need for car travel. Such measures may be particularly effective in the Arab region, where fuel prices are presently subsidized in many countries. The social impacts must, however, be taken into consideration when weighing up the advantages and disadvantages of using fuel pricing to inhibit vehicle use.

3. Improving traffic management

(a) *General improvements*: Improving traffic flow and circulation and providing better facilities and road infrastructure can result in greater fuel efficiency and, at the same time, reduce levels of traffic-related pollutants and noise. Improving traffic management in urban areas provides a cost-effective technique to reduce transport-related pollution. It has been observed in many large cities of Arab countries that such simple changes as changing two-way streets into one-way streets, and changing direction of traffic of certain major roads during peak hours to provide more lanes in the direction of heavy traffic has resulted in substantially smoother traffic flow.

(b) *Transport information and communications systems*: Information technologies provide a set of advantages, including: (i) giving buses and trams priority at traffic signals, helping to speed up public transport; (ii) monitoring bus, tram, and train movements, allowing control of services and the provision of real time information; (iii) providing up-to-the minute information on routes, timetable, station facilities whether via call centers or direct over the internet; and (iv) supporting the management, operation, and administration of transport systems. In vehicles, such systems can provide real-time traffic information that can be used to optimize efficiency in travel and freight transport.

4. Controlling vehicle use and ownership

The increase in fuel consumption is mainly attributed to the sharp increase in the number of vehicles. Therefore, controlling the use and ownership of vehicles is an important measure in achieving sustainable transport, particularly for emission abatement in congestion areas that are subject to heavy traffic. Restricting the vehicle use also reduces operation and maintenance costs. Traffic authorities should restrict vehicle ownership to levels that will prevent general congestion across an entire road network. Traffic authorities, in cooperation with other governmental bodies, should establish appropriate mechanisms to restrict the use and ownership of vehicles, taking into account social and economic considerations within a country. In Caracas, for example, in order to reduce pollution, the use of private vehicles in the city centre was prohibited for one day of every week based on the car registration number.

5. Improving vehicle maintenance and implementing inspection programmes

In many Arab countries, vehicle efficiency is low and specific fuel consumption is high. Regular maintenance, inspection, and tuning can improve fuel consumption and deliver such other benefits as reducing exhaust emissions, optimizing fuel efficiency, extending vehicle life, increasing vehicle resale value, and reducing running costs. It is not unusual to find that more than 70 per cent of the light-duty vehicle fleet in a developing country does not receive regular maintenance or diagnostic testing, and has an average age of about 15 years.²⁵ In certain cases, the most technically advanced testing and repair programmes can reduce air pollution by as much as 30 per cent.²⁶

6. Replacement of old vehicles with new ones

Wear and tear makes vehicles more polluting and less roadworthy over time. Older vehicles are more likely to break down on the road, causing congestion and posing a danger to other road users. In Arab countries, replacement of old vehicles would impose a heavy economic burden, making implementation very difficult. Therefore, it is recommended that Governments take appropriate measures, especially incentives, to encourage car owners to replace old vehicles with new ones.

Since Arab countries import most of their vehicles, it will be necessary to modify their importing specifications in order to introduce vehicles of better quality and with low emission engines to replace older ones. However, this would have a major economic cost and need long-term plans.

7. Better urban planning and land use

Good urban planning can provide an appropriate solution for traffic congestion and mitigate vehicle emissions. An increase in urban settlement activity calls for a corresponding increase in transportation capacity. Systematic town planning can therefore play a major role in minimizing the number of daily vehicle trips required.

Communities should be designed in ways that promote sustainable transportation development and facilitate access. It is observed almost everywhere that uncontrolled urban growth, in conjunction with increasing demand for mobility and communication, impedes efforts to improve traffic conditions.

²⁵ *Global Transport and Energy Development: The Scope for Change*. 1998. London: World Energy Council.

²⁶ United States Environmental Protection Agency, Office of Transportation and Air Quality, available at: <http://www.epa.gov/otaq/>.

B. ADOPTING ADVANCED TRANSPORT TECHNOLOGIES

Advanced transport technologies include: (a) electric vehicles using electricity, batteries, fuel cells or hybrid power sources; (b) catalytic converters; and (c) cleaner-fuel vehicles, running on natural gas, compressed (CNG) or liquefied (LNG), propane, methanol, or ethanol.

1. *Cleaner-fuel vehicles*

Cleaner-fuel vehicles run on three types of fuel – natural gas, propane, and biofuel (ethanol and methanol).

Natural gas and propane vehicles are the most widely used of the cleaner-fuel vehicles. The major difference between gasoline vehicle and natural gas/propane vehicle is the fuel system. Natural gas/propane can be stored on board in pressurized insulated tanks. There are three types of natural gas/propane vehicles: (i) bi-fuel vehicles, which run on either gas or gasoline; (ii) dual-fuel vehicles, which run on either diesel fuel only, or diesel and gas simultaneously, with the combustion of the diesel serving to ignite the gas; and (iii) dedicated natural gas vehicles, which run on natural gas only. Natural gas/propane fuel has several economic, social and environmental benefits, especially for countries that have natural gas resources. Regarding environmental benefits, it is reported that vehicles running on natural gas have lower CO, NO_x, and non-methane organic emission than those running on gasoline by 70 per cent, 87 per cent and 89 per cent, respectively. These values are affected by such factors as engine condition, the operating condition and fuel quality.

Biofuel is mainly ethanol and methanol. Both are excellent automotive fuels with very low emissions of ozone-forming hydrocarbons and toxic compounds. Ethanol is made from renewable resources and can be produced domestically, but has high fuel cost and lower vehicle range. Methanol can be produced from a variety of feedstocks and other renewable resources, but it has lower vehicle range.

The first generation biofuels are made from sugar, starch, vegetable oil, or animal fats using conventional technology. The production processes of second generation biofuels use a variety of non-food crops. These include waste biomass, the stalks of wheat, corn, wood, and special energy or biomass crops. Many second generation biofuels are still under development. Due to food crises, particularly in the developing world, the second generation is recommended.

2. *Electric vehicles*

(a) *Electric traction and railway electrification*: Electric traction can be used in train, metro over and under ground and tram and is more appropriate for heavily trafficked routes. The main advantage of electric traction is a higher power-to-weight ratio than in such forms of traction as diesel or steam that generate power on board. Other advantages include the lack of exhaust at point of use, less noise and lower maintenance requirements of the traction units. The main disadvantage is the capital cost of the electrification equipment, most significantly for long distance lines that do not generate heavy traffic. Many countries use electric traction, for example in 2006, about 40 per cent of the British rail network was electrified.²⁷

(b) *Fully electric vehicles*: Battery-powered vehicles give off virtually no pollution and offer one of the best options for reducing motor vehicle emissions in polluted cities. Producing affordable batteries with less weight and more capacity remains the key to the market success of electric vehicles.

²⁷ See: http://en.wikipedia.org/wiki/Railway_electrification_in_Great_Britain#Facts_and_figures.

(c) *Fuel cell and electric vehicles*: A fuel cell is an electrochemical engine, with no moving parts, that combines hydrogen and air to produce electricity. Hydrogen can be produced inside the fuel cell itself from such fuel as methane or natural gas, or by the electrolysis of water. The United Nations Development Programme (UNDP) has initiated programmes to promote the use of hydrogen fuel cells in buses in Brazil, China, Egypt, India and Mexico-countries that contain many of the world's mega-cities. These programmes also receive funds through the Global Environment Facility (GEF).

(d) *Hybrid vehicles*: The range and performance of an electric vehicle can be considerably improved when a combustion engine is coupled in series or parallel with an electric power to form a hybrid electric vehicle. Hybrid vehicle technology offers a viable way to improve fuel efficiency, especially in urban traffic, where vehicles must constantly stop and start. The disadvantage of the hybrid vehicle is its complex power train and emissions from the internal combustion auxiliary power unit.²⁸

As electric vehicles are powered by batteries, ways to charge these batteries need to be readily available. When charging these from the electricity grid, the overall efficiency and reduction in emissions is questioned as power generation in the Arab countries relies mainly on fossil fuels. Nevertheless, these cars would reduce pollution in heavily polluted cities.

3. *Catalytic converters*

Catalytic converters are used in the engines to reduce harmful emissions (CO, NO and unburned evaporated hydrocarbons), converting them to less toxic emissions (CO₂, N₂ and H₂O). In heavily condensed metropolitans, these converters could have great impact on the pollution level, especially in poorer and heavily trafficked cities and neighbourhoods where older cars, not equipped with catalytic converters, are still in use.

C. IMPROVING FUEL SPECIFICATIONS

Upgrading the quality of fuel and improving its specifications have great benefits regarding emission reduction and control. Emission reduction due to improving fuel quality can be classified into: (a) direct reduction by improving fuel specifications and fuel savings; and (b) indirect reduction by enhancing catalytic converter efficiency. The most important processes for improving fuel quality include the following:

1. *The use of reformulated gasoline*

Gasoline is made up of various hydrocarbon compounds, including aromatics, olefins and benzene, all of which contribute to ozone formation and toxic pollution through evaporation and combustion. These compounds are present in smaller quantities in reformulated gasoline, resulting in fewer harmful emissions. Reformulated gasoline provides the same performance characteristics as conventional gasoline but produces less damaging emissions.

2. *Limits on gasoline volatility*

Benzene and other toxic compounds in gasoline are released into the air when gasoline evaporates. Limits on gasoline volatility have therefore been imposed in some countries in order to control evaporative emissions of both hydrocarbons and toxic compounds.

3. *Limits on sulphur in diesel fuel*

Lowering the sulphur content of diesel fuels reduces emissions of particulate matter and other toxic air pollutants produced by diesel fuelled vehicles, in particular buses and trucks. In the combustion process, sulphur reacts with air and forms sulphur dioxide (SO₂), high concentrations of which can cause respiratory problems and may aggravate existing respiratory and cardiovascular conditions. Emissions of SO₂ also

²⁸ Report of Secretary General on energy and transportation (E/C.13/1998/6), Committee on Energy and Natural Resources for Development, 3rd session, New York, 23 March-3 April 1998.

contribute to acid deposition, or acid rain, which causes acidification of lakes and streams and can damage trees, crops, historic buildings and statues.

4. *Oxygenated fuels*

Additional oxygen in fuel ensures that fuel is burned more completely. This, in turn, can reduce vehicle CO emissions by 10-20 per cent. Such fuel additives as ethanol tertiary butyl ether, a methanol derivative, supply the extra oxygen.

D. PROMOTING ROAD NETWORKS AND RURAL TRANSPORTATION

Transport provides accessibility to goods, services, jobs, educational opportunities, friends and relatives and to all local and national communities. It can also help enhance regional integration and trade.

1. *Upgrading national and regional networks*

Transport infrastructure and roads between neighbour countries are crucially important for person mobility and trade. ESCWA, the League of Arab States and countries in the region have devoted efforts to upgrade and standardize regional road networks as will be designed in chapter III.

2. *Rural transport sustainability*

Approximately one billion people living in rural areas in the world still do not have access to reliable roads.²⁹ Without reasonable road networks and transportation accessibility to rural and poor areas, the quality of life does not improve and poverty is prolonged. The development of transport infrastructure is a key issue for developing road networks and enhancing transport accessibility to rural and remote areas. In addition, the promotion of such intermediate means of transport as bicycles would make rural transport between villages more viable. By viewing the local villagers as potential users of rural transport, planners should assess their needs for mobility and access to goods and services.³⁰

E. PROMOTING SAFE TRANSPORT

Every day, about 2,700 people in the world die from road traffic accidents; low-and middle-income countries account for 90 percent of the deaths. This costs those countries between 1-2 per cent of their gross national product (GNP) – often more than the total development aid they receive.³¹ Traffic accidents on the roads have increased during the last years, especially with the increase in the number of people and vehicles, and mobility. It is regrettable that, despite the fact that this problem affects all segments of society, the issue of road safety has not received sufficient attention so far at the international and national levels.³² The estimated number of persons who died in road traffic worldwide was about 0.723 million in 2000, and is expected to be about 1.204 million in 2020. About 50 per cent of traffic fatalities are young people. The World Health Organization estimates that traffic accidents will be the second main cause of death and injury in the developing countries by 2020.³³

²⁹ See: <http://web.worldbank.org/WBSITE/EXTERNAL/NEWS/0,contentMDK:21517582~menuPK:34480~pagePK:64257043~piPK:437376~theSitePK:4607,00.html>.

³⁰ See: http://www.cce.mtu.edu/peacecorps/documents_july03/Sustaining_Rural_Transportation_FINAL.pdf.

³¹ See: <http://web.worldbank.org/WBSITE/EXTERNAL/NEWS/0,,contentMDK:21517582~menuPK:34480~pagePK:64257043~piPK:437376~theSitePK:4607,00.html>.

³² منظمة الصحة العالمية، منشورات مارجي بيدين وآخرون، التقرير العالمي عن الوقاية من الإصابات الناجمة عن حوادث المرور، جنيف، ٢٠٠٤.

³³ See: http://www.europa-eu-un.org/articles/en/article_310_en.htm.

Indicators pointed out that the rate of traffic deaths and injuries in the Arab countries is high compared to developed countries. The following are a set of recommendations to enhance traffic safety and reduce traffic death and injuries in Arab countries:³⁴

- (a) Promoting the education and providing awareness-raising campaigns in the field of traffic safety, with focus on poor and rural areas;
- (b) Improving infrastructure of the transport systems and introducing advanced traffic technologies;
- (c) Developing and improving emergency road medical services;
- (d) Developing the road networks and improving traffic systems and signs;
- (e) Providing training for drivers and improving their skills;
- (f) Checking the readiness of the vehicles in terms of technical requirements and the availability of safety measures;
- (g) Enhancing the cooperation and coordination with ministries, associations and organizations involved in traffic accidents, and empowering the cooperation with Arab associations and international organizations concerned with traffic safety;
- (h) Establishing accurate statistics (database) on traffic safety and undertaking traffic analyses;
- (i) Providing humanitarian assistance to the victims of traffic accidents.

F. ADOPTING STANDARDS REGULATION AND INSTITUTIONAL FRAMEWORKS

The regulatory and institutional frame for sustainable transport should cover the above-mentioned priority options, including fuel specifications, vehicle emission standards, vehicle technology, fuel tariffs, road safety, urban planning and land use, and vehicle ownership and mobility. Regulations and standards related to environment protection and vehicle emissions, fuel specifications and traffic safety are the most important part in realizing sustainable transport.

1. *Upgrading environmental regulation and standards*

Generally, environmental standards relating to the mitigation of transport-related greenhouse gas emissions can be classified into two categories as follows:

(a) *Emission performance standards*: This category aims to regulate transport fuel specifications and motor vehicle emissions. Such regulations have been adopted mainly in industrialized countries, where they have resulted in significant reductions in emissions of CO, NO_x and HC. In developing countries, little has been done so far in this regard. Performance standards include the following:

- (i) Maximum emission levels and smoke standards;
- (ii) Fuel efficiency standards;
- (iii) Vehicle certification and testing regulations;
- (iv) Standards relating to refrigerant leakage;
- (v) Vehicle durability standards;
- (vi) Maximum power-to-weight ratios;
- (vii) Fuel quality standards, setting limits on impurities;
- (viii) Limitations on fuel additives;
- (xi) Fuel volatility standards;
- (x) Refuelling control regulations.

³⁴ E/ESCWA/GRID/2007/13, 13 November 2007.

(b) *Technology standards*: Technology standards apply essentially to new vehicles and clean-fuel vehicles. It will therefore take years before these standards will fully penetrate the global vehicle fleet. Technology standards can be classified as: standards for advanced-vehicle technology (electric vehicles and fuel-cell vehicles); natural gas vehicle technology standards; and standards for vehicle pollution control technologies.

2. *Upgrading traffic regulations*

Standards in this category are established in order to moderate the growth of road traffic and the environmental impacts of transport activity. They include the following:

- (a) Fuel pricing regulations favouring clean fuels;
- (b) Regulations for retiring old and/or polluting cars (for example, the establishment of financial incentives);
- (c) Regulations restricting the import of cars that are highly polluting and/or consume fuel at an excessive rate;
- (d) Regulations restricting vehicle use and ownership;
- (e) Regulations relating to road taxes;
- (f) Traffic regulations;
- (g) Vehicle taxes scaled according to emission levels;
- (h) Regulations relating to driver instruction.³⁵

Sustainable transport regulations and standards differ markedly around the Arab region as a result of the diversity of transport conditions and circumstances in various countries and the structure of each country's transport sector. Generally, the effectiveness of sustainable transport regulations can be enhanced if they link with economic incentives. Capacity-building and awareness are also essential in implementing sustainable transport programmes.³⁶

3. *Enhancing institutional frameworks*

Developing an institutional frame for the transport sector is not an easy task and requires cooperation and coordination between various parties concerned, including Governments, the private and public sector, non-governmental organizations (NGOs) as well as regional and international organizations. The Governments in the Arab region have the major role among all players, which should include the following:

- (a) Lead the strategic planning for the transport sector taking into account transport sustainability;
- (b) Set up a regulatory framework coupled with sustainable transport planning and the use of economic instruments;
- (c) Coordinate related activities and support cooperation between sustainable transport stakeholders including vehicle users, fuel producers, NGOs, and international organizations;
- (d) Raise awareness of decision makers within Governments and industry, as well as strengthen capacity building in the field of sustainable transport;

³⁵ Details of transport-related environmental standards in the United States, European Union countries and the ESCWA member States can be found in ESCWA, *Towards harmonization of environmental standards in the energy sector of ESCWA member States* (E/ESCWA/ENR/1999/21).

³⁶ UNEP, *Global Green New Deal—A Policy Brief*, March 2009.

(e) Promote the integration of sustainability considerations into transport provision and planning, and disseminate best practices related to sustainable transport;

(f) Support and empower civil society and NGOs, and encourage private sector partnership to maintain sustainable transport;

(g) Develop the necessary financial schemes that would generate the appropriate environment for promoting sustainable transport.

III. PROGRESS ACHIEVED ON SUSTAINABLE TRANSPORT IN THE ARAB REGION

During the last two decades, national authorities in Arab countries have devoted efforts to improve the sustainability of their transport sector; in addition, several regional activities among Arab countries were implemented. Such efforts covered many of the goals and targets relevant to the key transport issues identified by Agenda 21. Despite these efforts, many steps are still required to further adopt sustainable transport policies and measures that can support the sector's contribution to achieving sustainable development in the Arab region. The main progress achieved on realizing the six identified priority options for achieving sustainable transport in the region, could be summarized in the following:

A. POLICIES AND MEASURES FOR IMPROVING MANAGEMENT OF THE TRANSPORT SECTOR

Enhancing policies and improving operation and management of the Arab transport sector pushed concerned authorities to work on various directions, including: public transport, vehicle maintenance and inspection, traffic management, transport information technologies, fuel pricing, vehicle use and ownership, replacement of old vehicles with new ones, as well as urban planning and land use. The following are examples of achievements in this regard:

1. *Promoting the use of public transport*

Major steps to promote the use of public transport either have been taken or are under serious consideration in some of the major cities of the Arab region. In Cairo, for example, the construction of the underground has eased traffic congestion considerably. In Damascus and Amman, plans for the construction of light rail systems are being assessed.³⁷ The following spotlight examples of actions taken by Arab countries:

Egypt: The underground metro in Cairo is the major public transport project in the region. A 63 km underground network links the three governorates which form the Cairo metropolitan region, Cairo, Giza and Qalyoub. The network comprises two lines: line 1, Helwan-El-Marg, and line 2, Shubra-El-Kheima-Mouneeb. Line 1, which was completed in 2000, is 44 km long and currently carries about 1.5 million passengers per day. Line 2, 19 km long, was completed in 2005 and is now used by 1.2 million passengers per day. The current plans include building a third line from Cairo International Airport, east of Cairo, to Imbaba in the west. The new line, about 33 km in length, will have a design capacity of 2.1 million passengers per day. Three additional lines are envisioned for the year 2022.³⁸

Dubai: On 10 September 2009, Dubai Metro started operation with trains going from the Mall of the Emirates to Rashidiya. Dubai Metro is part of the promotion of public transport policy in Dubai. The construction cost of this project has increased by about 80 per cent from the original US\$4.2 billion to US\$7.62 billion.³⁹ There are one million cars on Dubai's roads and it is expected that, when the Metro is fully operational, this number will be reduced by 30 per cent.⁴⁰

³⁷ ESCWA, *Assessment of Transport Related Pollution* (E/ESCWA/ENR/1999/12), a paper presented at the Expert Group Meeting on the Harmonization of Environmental Standards in the Energy Sector of the ESCWA Member States held in Cairo, 29 June-1 July 1999.

³⁸ Egyptian Tunneling Society, 2004.

³⁹ See: http://www.uaeinteract.com/docs/Metro_stations_reflect_nature/37468.htm.

⁴⁰ See: <http://www.gulfnews.com/opinion/columns/nation/10350106.html>.

Saudi Arabia: is planning to establish a high speed railway to connect Maka Al-mokarama, Al-Madena, Al-Monawara and Gadda.⁴¹

Jordan: Jordan is planning to establish a railway line between Amman and Zarqa with a capacity of 100 000 passengers per day. This project aims at: (a) improving efficiency of public transport in Greater Amman; (b) preserving the environment and reducing emissions; and (c) mitigating traffic jams and reducing road accidents.

Qatar: The country has short- and long-term action plans to provide modern public transport means equipped with anti-pollution devices.

2. *Improving traffic management*

A wide range of plans and measures to solve traffic problems and reduce traffic jams have been adopted particularly in such major cities in the region as Cairo and Damascus. According to the questionnaire disseminated on Arab countries and the answers thereto, several Arab countries, including Bahrain, Egypt, Jordan, Lebanon, Oman, Palestine, Saudi Arabia and the Syrian Arab Republic have taken various steps to improve traffic management.

An example illustrating the environmental advantages of more smoothly flowing urban traffic is provided by a field study conducted in Greater Cairo on two main traffic corridors namely the Sudan Street and Malek al-Saleh. The field study included three traffic management options.⁴² The degree of improvement that can be achieved depends on the route and journey direction, as well as the proposed traffic management modifications. The energy saving on the Sudan Street route, for example, ranged from 11.5 per cent to 15.2 per cent, with a reduction in CO emissions of 2.4-16.1 per cent, whereas for the Malek al-Saleh route, energy savings ranged between 41.8 per cent and 45 per cent, while CO reductions were between 5.5 per cent and 22.6 per cent.

Traffic information technology has considerable advantages; yet, its use in the Arab countries is still limited, which is due to inappropriate communication infrastructure. Dubai has achieved a great progress in this field. The port of Dubai has used the state-of-the-art information technology (IT) for container terminal management, port operation, ship movement control, and customs processes. Moreover, the Dubai Transport Corporation (DTC) provides taxi services using an automatic vehicle location (AVL) and tracking system. Some Arab countries, such as Egypt, Jordan, Lebanon and Saudi Arabia have also taken steps towards using IT in ports and customs operation and management.⁴³

3. *Vehicle emissions testing and tuning*

Many Arab countries (e.g. Egypt, Jordan, Kuwait, Lebanon, Saudi Arabia and the Syrian Arab Republic) established regular vehicle emission testing (VET) programmes. The programme of Egypt, for example, was applied on 13,000 vehicles in Cairo in 1999 and revealed that 66 per cent complied with national emission standards and 34 per cent did not comply. It is estimated that the average emission reduction due to emissions tuning would be 62 per cent for CO and 35 per cent for HC, while fuel saving would be about 15 per cent.⁴⁴

⁴¹ AL-BIA WAL-TANMIA Environment & Development, Volume 14, Number 139, October 2009.

⁴² *The Impact of Traffic Management on Fuel Consumption and the Environment in the Transport Sector in Urban Areas*, Organization for Energy Planning, Cairo, Egypt, January 1996.

⁴³ *Transport and Sustainable Development in the ESCWA Region*, background paper no.8, DESA, DSD-9, 16-27 April 2001, New York.

⁴⁴ *Options for greenhouse gas abatement in the ESCWA region: case study of Egypt*, a consultancy report prepared for ESCWA, 2000.

4. *Replacing old cars with new ones*

In some Arab countries, there are passenger cars in use which are 24 years old or even older. For example, in the Syrian Arab Republic, about 60 per cent of passenger cars are at least 13 years old; in Egypt, about 65 per cent of the vehicles are 10 years old or more, and some 25 per cent of these vehicles are about 20 years old;⁴⁵ in Palestine, about 60 per cent of the vehicles are between 5-15 years old; and in the Sudan, about 70 per cent of the locomotives and rails are more than 25 years old.

Egypt focused on replacing old Cairo taxis, which will be completed by 2012. Jordan has taken a positive step to replace the old fleet of taxis operating in its major cities. A retrofit plan was introduced to replace the old public transport fleet. To support this plan, the authorities provided custom exemptions for medium-sized passenger cars and buses and reduced the sales tax. In addition, taxi owners have been granted an exclusive exemption from taxes if they replace their old vehicles with new ones.⁴⁶ The Sudan, in cooperation with China and India, is seeking to replace old locomotives and trains with new ones. The aim of this trend is to reduce emissions from rail transport.

5. *Better urban planning and land use*

In Arab countries in general, urban settlements are developing erratically, without adequate public transport infrastructure.⁴⁷ Arab countries can benefit from the experiences of an urban planning and land use as practiced in developed countries, avoiding mistakes that other countries have made and emulating their successes as they build or complete their transport infrastructure. With population growth and development requirements at various levels, efforts are being done to maintain and modify urban planning and land use in several Arab countries. Many such Arab countries as Egypt, Qatar, Saudi Arabia and the Syrian Arab Republic have developed their urban and road plans during the last years. In addition, urban infrastructures with modern road networks have been established in many Arab countries.

B. ADOPTING ADVANCED TRANSPORT TECHNOLOGIES

1. *Cleaner fuel vehicles – natural gas*

Even though that the Arab region has huge natural gas reserves, the use of the natural gas in the transport sector is limited. The CNG technology is applied at a large scale in Egypt, and at demonstration and pilot scale in Qatar.

In Egypt, the first company to convert gasoline vehicles to natural gas was established in December 1994. By 2009, there were seven operating CNG companies, about 114 CNG fuelling stations and about 113,000 CNG vehicles in use in Egypt, mainly in Cairo, 75 per cent of which are taxis. This represents about 3 per cent of the world's CNG vehicles. A primary key to the success of the natural gas vehicles industry in Egypt is a package of incentives offered by the Government, including five-year tax holidays for CNG companies, low-cost conversion charges for car owners and the attractive price differential between CNG and gasoline. A typical vehicle conversion kit costs the customer about US\$900. Such high fuel use vehicles as taxis can recover the cost of conversion in as little as six months from fuel savings alone. This clearly explains why such emphasis has been placed on the conversion of taxis.

Another CNG application started in 1997 as a cooperation between the Cairo Air Improvement Project (CAIP) and Cairo Transport Authority (CTA), where 50 CNG busses, the bodies of which are built in Egypt,

⁴⁵ *Transport and Sustainable Development in the ESCWA Region*, background paper no.8, DSD-9, 16-27 April 2001, New York.

⁴⁶ Ibid.

⁴⁷ Ibid.

were operationalized and two garages have been established for refueling and servicing these buses. To enforce and settle CNG technology, the Egyptian Organization for Standardization issued a number of standards and regulations for CNG vehicles, fuel systems and refilling stations.

As a pilot project, Qatar uses natural gas in some taxis. In Palestine, a study prepared by the World Bank discussed the use of natural gas instead of gasoline and diesel, and upgrading diesel specifications to go with Euro 4 standards of January 2005.⁴⁸

2. *Electric vehicles*

Using electric vehicle technologies is still limited in Arab countries. However, some progress has been achieved in this regard:

(a) GEF sponsored a project to demonstrate hybrid buses in Egypt. The buses were procured under a GEF-sponsored project entitled Introduction of Viable Electric and Hybrid Electric Bus Technology in Egypt, and were expected to begin operation in early 2001 as shuttle buses around the historic site of the pyramids outside Cairo.

(b) A preliminary study was carried out in 1999 on the feasibility of the Cairo-Alexandria railway line electrification. As Egypt is an importer of diesel fuel, which is subsidized by the Government for domestic use, and as part of the Government's switching-to-gas policy, the anticipated environmental and economic benefits of rail electrification would include lower operation and maintenance costs and improved economic efficiency.

(c) Qatar started negotiations with a Chinese company to manufacture electric vehicles, which are part of activities to reduce emissions in the transport sector.

C. IMPROVING FUEL SPECIFICATIONS

Generally, the current specifications of gasoline and diesel fuel produced in the Arab region can be classified into three groups: (i) countries that have made considerable efforts to improve fuel quality in order to match international norms (e.g. Gulf countries); (ii) countries that are moving towards cleaner fossil fuels (e.g. Egypt, Jordan and the Syrian Arab Republic); and (iii) countries that have showed interest in upgrading fuel quality, but have not adopted obvious plans (e.g. Iraq and Yemen). The transport fuel specifications in many Arab countries are characterized by: high concentration of sulfur in both gasoline and diesel, low cetane number of diesel (in some Arab countries less than 51), and high percentage of aromatics in gasoline.

Based on a study carried out in the ESCWA region in 2005,⁴⁹ improving fuel specifications can achieve considerable environmental and economic benefits. In this regard, the reduction in carbon dioxide (CO₂), nitrogen oxides (NO_x), carbon monoxide (CO), particulate matter and hydrocarbon (HC) due to improving gasoline specifications could reach 6.8 per cent, 17.2 per cent, 39.2 per cent, 35 per cent, and 22.7 per cent, respectively. The reduction in CO₂, NO_x, CO, particulate matter, HC, and VOCs due to improving diesel fuel specifications could reach 14.7 per cent, 16 per cent, 54 per cent, 42.3 per cent, 56.5 per cent and 38.7 per cent, respectively. Furthermore, improving fuel quality can lead to economic benefits, including:⁵⁰ (i) fuel savings in the transport sector by about 2.3 million tons per year, which is equivalent to 6.7 per cent of total gasoline consumption in transport; (ii) fuel savings in diesel amounting to approximately 2.4 million tons per year, which is equivalent to 14.4 per cent of total diesel consumption in transport; and (iii) net

⁴⁸ European emission standards are referred to as Euro 1 to Euro 5 for light duty vehicles and define the acceptable limits for exhaust emissions of new vehicles. Available at: www.dieselnet.com/standards/eu/ld.php.

⁴⁹ *Uses of Cleaner Fossil Fuel in Selected ESCWA Countries*, E/ESCWA/SDPD/2005/1(Part II), 7 April 2005.

⁵⁰ *Ibid.*

savings estimated at US\$207 million per year accrued in vehicle maintenance costs by complete lead elimination from gasoline.

The main efforts carried out in the region were related to lead elimination from gasoline and sulfur reduction in gasoline and diesel. In 2005, about 20 per cent of gasoline in the Arab countries was leaded. Currently, almost all gasoline used in the region is unleaded. Concerning sulfur reduction, the following achievements can be reported:

(a) *Kuwait*: New units were established in Ahmadi and Mina Abdullah refineries to reduce sulfur to 50 ppm. Meanwhile, refineries in Kuwait have a great potential to produce high-quality diesel fuel;

(b) *Lebanon*: Limited maximum sulfur content in diesel to 350 parts per million (ppm);

(c) *Jordan*: According to a plan ended in 2008 to improve fuel specifications, Jordan shifted completely to unleaded gasoline, and reduced sulfur concentration in diesel to go with the international norms. In this regard, sets of gasoline and diesel specifications were issued during the last years. It is prohibited to refine oil containing more than 2 per cent sulfur;

(d) *Bahrain*: In 2009, sulfur in diesel decreased to 500 ppm, and it was decided to reach 350 ppm in the near future, and to eventually reach 50 ppm;

(e) *Qatar*: Follows strict criteria to reduce the sulfur content to be 14-20 ppm in gasoline and 300 ppm in diesel;

(f) *Palestine*: Pays attention to improve diesel specifications to comply with Euro 4.

D. PROMOTING ROAD NETWORKS AND RURAL TRANSPORTATION

In order to upgrade road networks and sustain rural transport, stakeholders concerned, particularly planners, users, operators, and regulators, should be involved at a high level of cooperation and integration. Although more work is still needed to improve transport accessibility in the region, the following are selected achievements related to integrating road networks and sustaining rural transportation at national and regional levels in the Arab region.

1. *At national level*

Jordan is working on developing road networks, extending roads to remote areas and linking the governorates by building bridges and tunnels, in addition to maintaining, rehabilitating and asphaltting the roads linking remote areas nationwide. The Ministry of Public Works and Housing in Jordan is undertaking a package of projects, including establishing new roads and fixing old ones in rural and poor areas. During 2008-2009, a set of these projects was implemented. Recently, US\$6.8 million was assigned for agricultural roads and US\$6.8 million for rural roads.

In 2005, *Qatar* established a five-year plan, 2007-2011, to implement 32 projects, with the involved cost of US\$8.24 billion. The plan includes construction of new roads, bridges and tunnels, as well as maintenance of old roads. Doha Expressway, the most important project, links north and south Qatar via Doha; it consists of 13 independent phases, with a total cost of about US\$2.2 billion. In the beginning of 2008, ten major projects were launched in villages and remote towns, with a total cost of US\$101.6 million. These projects aim to establish an integrated road network with modern infrastructure facilities.

Egypt raised road construction investments from US\$73.3 million in 2003 to about US\$366.3 million in 2008. In addition, it raised road maintenance investments from US\$36.6 million in 2003 to about US\$146.5 million in 2008. Accordingly, the length of the network serving remote and poor areas increased

by about 2,640 km during the period of 2003-2008. Egypt was the first country to sign the Agreement on International Railways in the Arab Mashreq and ratified this agreement in May 2004.⁵¹

Palestine allocated US\$70 million in 2009 for rehabilitation of old roads and construction of new, mainly agricultural roads.

2. At regional level

It is planned to construct a bridge between Qatar and Bahrain with a cost of US\$4 billion. The construction of the bridge will take 48 months, and it will be one of the longest suspension bridges in the world, with 40 km over the sea. It will have several traffic lanes and a route of emergency, in addition to a lane for railway. The traffic capacity of the bridge is expected to be about five thousand vehicles per day, and would rise to twelve thousand vehicles by 2050.

As part of the development of the road network between Qatar and Saudi Arabia, the Salwa international road was constructed with a length of 81 kilometers. The road includes ten intersections and four lanes in each direction with an integrated lighting system.

In order to enhance transport among the Arab countries, the Agreement on International Roads in the Arab Mashreq entered into force on 19 October 2003.⁵² Routes M40 and M45 took high priority in the Arab Mashreq road network. Route M40 connects Iraq, Jordan, Palestine and the South Mediterranean coast, with a length of 2228 km; and Route M45 connects the Syrian Arab Republic, Jordan, Saudi Arabia and Yemen with a total length of 3713 km.

It is proposed to establish a railway system to link GCC countries, in addition to establish multi-purpose companies for road, water and air transport in the Gulf region.

A protocol exists between Egypt and the Sudan to extend the rail line between the two countries with a length of 375 km, and a total cost of US\$1,600 million.

Five agreements related to passengers and goods transport have been signed between the Sudan and Egypt, Jordan, Saudi Arabia and the Syrian Arab Republic, and some African countries.

Jordan has a master plan to construct a rail network to link the urban centres of Jordan with neighbouring countries for the purpose of passengers and goods transport.

E. PROMOTING SAFE TRANSPORT

In cooperation with the United Nations Fund for Development, ESCWA is implementing a project on national and regional targets for reducing traffic fatalities on the roads. The project started in 2008 and is expected to be completed at the end of 2009. Within the framework of this project, a survey was conducted to assess the situation of national and regional road safety in terms of management, organization of information, and strategies for road safety in ESCWA countries. The results of the survey indicated that.⁵³

(a) Many ESCWA countries (Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Oman, Palestine, and Saudi Arabia) have one or more entities in the area of traffic safety;

⁵¹ ESCWA. *Agreement on International Railways in the Arab Mashreq* (E/ESCWA/TRANS/2002/1/Rev.2), 5 March 2003.

⁵² ESCWA, *Agreement on International Roads in the Arab Mashreq* (E/ESCWA/TRANS/2001/3), Beirut, 18 May 2001.

⁵³ تقرير عن الردود على استبيان لتحسين السلامة المرورية على الطرق: تحديد الأهداف الوطنية والإقليمية لخفض ضحايا حوادث المرور على الطرق - الإسكوا ٢٠٠٩.

(b) Most ESCWA countries (Bahrain, Egypt, Iraq, Jordan, Kuwait, Oman, Palestine, Saudi Arabia, Syrian Arab Republic and the United Arab Emirates) have national strategic plans to reduce the number of traffic accidents. The targets of these plans in selected Arab countries are:

- *Bahrain*: reduce deaths, serious and minor injuries and physical losses by 30 per cent in ten years;
- *Jordan*: reduce traffic accidents and their human and physical consequences by 5 per cent per year in five years;
- *Saudi Arabia*: reduce negative consequences of accidents by 50 per cent in 15 years;
- *United Arab Emirates*: reduce the number of traffic deaths to 1.5 per 100 thousand of the population, reduce traffic congestion and cases of collapse as well as accidents, and promote a reasonable and safe traffic culture.

To enhance the cooperation and integration between the Arab countries in the field of traffic safety, the Arab Organization for Traffic Safety was established. The mission of this organization is to promote traffic safety and enhance joint Arab activities in the fields of traffic safety and road accidents prevention.

To build the capacity in the field of road safety, ESCWA arranged four workshops during recent years. The purpose of the last of these workshops was to set regional and national road traffic casualty reduction targets in cooperation with the National Transport Authority in the United Arab Emirates, and it took place on 16-17 June 2009. This workshop was part of preparations for the first United Nations Ministerial Conference on Global Road Safety, to be held in Moscow in November 2009. The workshop set the target of 30 per cent reduction of road crash fatalities in the region by the year 2015.⁵⁴

At the country level, significant efforts have been carried out to improve traffic safety and reduce road accidents. For example, Qatar made remarkable achievements regarding traffic safety during the last years, including the issuance of traffic law No. 19 in 2007, improving road network traffic and launching national campaigns.⁵⁵ Due to these efforts, traffic performance in 2008 improved by 2.7 per cent and the total number of traffic accidents decreased by 28.6 per cent compared to 2007. In Jordan, the rate of traffic accidents in 2008 decreased by 8.65 per cent (from 110,630 to 101,066) and the number of road accident deaths decreased by 25.4 per cent (from 992 to 740) compared to 2007.

F. ADOPTING STANDARDS, REGULATIONS AND INSTITUTIONAL FRAMEWORKS

In recognition of the importance of regulations, standards and institutional frameworks related to sustainable transport, significant achievements have been observed, including the following:

1. *Adopting standards and regulations*

(a) *Emission control and fuel specifications*

Environmental laws and regulations in the Arab countries usually include articles prohibiting the use of machines, engines or vehicles that produce emissions exceeding set limits. In many cases, however, the regulations are either not yet sufficiently developed or enforced and/or the standards they set have not been

⁵⁴ ESCWA Weekly News, Issue 25/52, 29 June 2009.

⁵⁵ See: www.vivreauqatar.com/Download/Traffic_law_07.pdf for the provisions of Qatar Traffic Law Decree No. 19 of 2007.

adequately defined. Countries in the region have revised, updated or issued many regulations and standards and included one or several of the following emission control abatement regulations and standards.^{56, 57}

- (i) *Fuel specifications and emission performance standards*: These standards regulate transport fuel specifications and motor vehicle emissions (mainly CO, NO_x and HC). Such regulations have been adopted mainly in industrialized countries, focusing on: maximum emission levels and smoke standards; fuel efficiency standards; vehicle certification and testing regulations; fuel quality standards, setting limits on impurities; limitations on fuel additives; and refueling control regulations. In the Arab countries, several standards and regulations related to fuel quality have been issued during the last years, including the following:
- During 1996 and 2005, the Qatar General Organization for Standardization and Metrology issued eleven specifications, which focus on: gasoline test and lead concentration, concentration of sulfur in fuels, and vehicle emissions test methods for unleaded gasoline vehicles. Currently, all the gasoline used in Qatar is unleaded;
 - Saudi Arabia issued four fuel specifications and three vehicle emission standards during 1994-2002;
 - The Syrian Arab Republic issued eight fuel specifications for refineries in Homs and Banias and enacted decrees No. 1052 in 2004 and No. 847 in 2008 for controlling vehicle emissions as well as a decree for environment tax in 2005 regarding high emission vehicles;
 - The Sudanese Authority for Standards and Specifications issued a set of standards related to buses, cars and trucks;
 - The United Arab Emirates issued three specifications during 2002-2003 aiming to improve the properties of gasoline, diesel and fuel oil, in addition to setting standards for vehicle emissions;
 - A Bahraini draft ministerial decision was prepared to import diesel vehicles according to Euro 3 emission standards after producing diesel with 350 ppm sulfur, then according to Euro 4 and 5 at a later stage based on the availability of low-sulfur diesel;
 - Bahrain enacted Decree No. 21 in 1996 with its ten executive decisions and resolution No. 8 in 2002 for vehicle emission standards and vehicles inspection. This resolution required new imported gasoline vehicles starting from 2004 to install catalytic converters to reduce vehicle emissions.
- (ii) *Technology standards*: This category includes such advanced vehicle technology as electric vehicles and fuel-cell vehicles; natural gas vehicle technologies; and vehicle pollution control technologies. Since the uses of advanced transport technologies are limited in the Arab region, the effort related to regulations and standards of these technologies is also limited. In this regard, standards for CNG vehicle and CNG refilling station were established by the Egyptian Organization for Standardization and Quality Control and the CNG programme in 2002.⁵⁸
- (iii) *Standards relating to transport practices*: Standards in this category are established in order to moderate the growth of road traffic and the environmental impacts of transport activity. They

⁵⁶ ESCWA. *Towards Harmonization of Environmental Standards in the Energy Sector of ESCWA Member States* (E/ESCWA/ENR/1999/21).

⁵⁷ استبيان النقل المستخدم ٢٠٠٩.

⁵⁸ *Options and Opportunities for Greenhouse Gas Abatement in the Energy Sector of the ESCWA Region* (E/ESCWA/ENR/2001/15), Volume. I: Transport Sector. 2001.

include:⁵⁹ fuel pricing regulations favoring clean fuels; regulations for retiring old and/or polluting cars; regulations restricting the import of cars that are highly polluting and/or consume fuel at an excessive rate; regulations restricting vehicle use and ownership; regulations relating to road and traffic taxes; and regulations relating to driver instruction. Many such Arab countries as GCC countries, Egypt, Iraq, Jordan, Lebanon, the Sudan, Syrian Arab Republic and Yemen achieved remarkable progress issuing standards and regulations on transport practices, but these standards and regulations need revision, updating and activation.

(b) *Noise pollution*

In the Arab region, noise from traffic has not yet been considered as a major environmental problem that deserves strict measures. Furthermore, there are no fully satisfactory means to measure noise and the nuisance it causes. However, with the increasing dependence on road transportation and the subsequent rise in the number of operating vehicles, noise pollution will definitely require more attention and regulatory steps. Limited such Arab countries as Egypt and Lebanon have certain regulations related to noise intensity limitation.⁶⁰

(c) *Traffic safety*

Although the countries of the Middle East and North Africa represent only 2 per cent of the number of cars and only 5 per cent of the population in the world, they represent 6 per cent of the total road accidents and deaths worldwide. Deaths resulting from road accidents in the Middle East have increased by 20 per cent during the period from 1990 until 2000, whereas, in Europe, Australia and Japan, mortality decreased by about 10 per cent during the same period.⁶¹ From 1994 until 1997, there was an increase of about 40 per cent in the number of fatalities in the Arab region.⁶² Therefore, it is essential to pay more attention to organize traffic systems, improve traffic safety and the minimize the number of road fatalities in the Arab region. Accordingly, many national and regional traffic laws and regulations have been enacted during the last decade, including:^{63, 64}

- (i) *Syrian Arab Republic* (Law No. 31/year 2004), *Iraq* (Law No. 86/year 2004), *Egypt* (Law No. 66/year 1973, amended by Law No. 155/year 1999, and its executive regulation issued in 2000), *Yemen* (Law No. 46/year 1991, amended in 2000 and last amended in 2002), *Jordan* (Road Transport Law/year 1958 and Law No. 47/2001), *Bahrain* (Law No. 9 and its executive regulation/year 1979), *United Arab Emirates* (Federal Traffic Law No. 21 and its executive regulation/year 1995), *Saudi Arabia* (Royal Decree of Traffic System No. M/49/1391/year 1971, and executive regulation of the Minister of Interior No. 3974-1395/year 1975), *Oman* (Traffic Law No. 10 promulgated by Amir of Qatar and its executive regulation Minister of Interior/year 1979), *Kuwait* (Traffic Law No. 67, promulgated by decree of the Amir/year 1976, and its

⁵⁹ Details of transport-related environmental standards in the United States, European Union countries and ESCWA member States can be found in ESCWA, *Towards Harmonization of Environmental Standards in the Energy Sector of ESCWA Member States* (E/ESCWA/ENR/1999/21).

⁶⁰ *Transport and Sustainable Development in the ESCWA Region*, background paper no. 8, DSD-9, 16-27 April 2001, New York.

⁶¹ Jacobs, G.D. and Aeron-Thomas, A. *A Review of Global Road Accident Fatalities*, 65th Road Safety Congress, 6-8 March 2000, p. 12.

⁶² *Transport and Sustainable Development in the ESCWA Region*, background paper no.8, DSD-9, 16-27 April 2001, New York.

⁶³ *Review of Road Traffic Safety Conditions in the ESCWA Region*, (E/ESCWA/GRID/2005/6), 5 October 2005.

⁶⁴ *Review of Road Traffic Safety Conditions in the ESCWA Region – Part II* (E/ESCWA/GRID/2007/13), 13 November 2007.

executive regulation Interior Minister No. 81/year 1976), and *Lebanon* (a comprehensive law for organizing traffic/year 1968, and its amendments in 1995);

- (ii) The GCC General Secretariat issued the united indicative traffic law for Gulf countries;
- (iii) In terms of regional traffic regulations, ESCWA issued in its twenty-third session resolution 265 (XXIII), dated 12 May 2005; in this resolution, ESCWA called on member States to cooperate at the regional level in the field of road traffic safety.

(d) *Economic incentives and taxes related to vehicle design, purchase and use*

Many countries already levy taxes on vehicles and fuel, and in many instances vehicle taxes vary according to vehicle size, weight, engine size and/or fuel efficiency.⁶⁵ These incentives and taxes include fuel tax, vehicle tax, new vehicle incentives, road fees, user fees, and vehicle insurance.

2. *Developing institution frameworks*

According to the questionnaire disseminated on the Arab countries and their answers, several Arab countries, including Egypt, Jordan, Lebanon, Qatar and the Syrian Arab Republic, developed their transport institutional frameworks and enhanced administrative structures of transport sectors. These enhancements and modifications have been extended to various sub-transport sectors and to transport projects in the remote and poor areas.

G. GALVANIZING THE POLITICAL WILL

Arab leaders as well as the responsible ministries of energy and transport have expressed their political will and determination to support the sustainable development process and its national sectoral plans, including that on transport. They also expressed their will to cooperate with the international community in this regard in the following declarations:

1. *Kuwait Declaration*⁶⁶

The Kuwait Declaration delivered during the Arab Economic Summit, 19-20 January 2009, stressed the importance to link land, marine and air transportation networks among Arab countries as they are the main veins of trade, tourism, investment and labor movement within the Arab region, as well as to link it with its regional surroundings. Moreover, the Declaration stressed on seeking to uplift the competitive level of the Arab transportation facilities through approaching free transportation services policies among the Arab countries, particularly, in implementing open space programmes between them, as well as establishing regulatory frameworks to attract a higher level of international transportation movement, taking advantage of the distinguished geographical position of the Arab region. In this regard, the Arab leaders also urged Arab financial institutions to play an active role in increasing funding and investments in the Arab countries with special emphasis on integration projects. The summit issued a set of resolutions. One of them is dedicated to the Scheme to Link the Arab Countries by Rail and includes the following four articles:

- (a) Launching a project to link the Arab land by rail, according to the scheme which was approved by the Council of Arab Ministers of Transport, with member States having to take the necessary steps to amend and harmonize related national legislation and regulatory frameworks to prepare the project for implementation;

⁶⁵ *Options and Opportunities for Greenhouse Gas Abatement in the Energy Sector of the ESCWA Region* (E/ESCWA/ENR/2001/15), Volume. I: Transport Sector. 2001.

⁶⁶ Available at: http://www.da.gov.kw/eng/articles/arab_economic_summit_2009_speeches.php?p=summit_declaration.

(b) Setting a mechanism for financing the implementation of Arab rail link projects on a commercial basis. The contribution should be opened for the private sector, Arab financial institutions and Arab, regional and international funding, to invest in the implementation and operation of such projects;

(c) Requesting the Arab, regional and international finance institutions to contribute to financing the implementation of these projects;

(d) Mandating the Council of Arab Transport Ministers to follow up the implementation and prepare the required conventions for this project, in addition to submitting periodical reports on the progress achieved.

2. The Arab Ministerial Declaration on Climate Change

The Arab Ministerial Declaration on Climate Change, issued during the 19th session of the Council of Arab Ministers Responsible for the Environment (CAMRE), of the League of Arab States, Cairo, 5-6 September 2007 expressed a strong determination to achieve the following:

(a) Inclusion of policies to deal with climate change issues in all sectors within national and regional policies for sustainable development in a manner that harmonizes with sustained economic growth and efforts to eradicate poverty;

(b) Mitigation programmes shall focus on: the production and use of cleaner fuels, improving the efficiency of energy use in all sectors, diversifying energy sources in accordance with the prevailing economic and social conditions, expanding the use of cleaner production techniques and environmentally friendly technologies;

(c) Calling on the developed countries to provide the necessary support for technology transfer, capacity-building and financing to undertake a deeper and more comprehensive assessment of the potential impacts of climate change on the most vulnerable developing countries, including the Arab countries, to identify priorities and implement mitigation and adaptation programmes to climate change, and impacts of mitigation measures.

IV. TRANSPORT FOR SUSTAINABLE DEVELOPMENT IN THE ARAB REGION, CHALLENGES AND POLICY FRAMEWORK

In spite of the efforts devoted by Arab countries and the progress achieved towards enhancing the role of the transport sector in achieving sustainable development, countries are still facing several challenges in reaching the planned objectives in the field. Meanwhile, there is a strong need for appropriate policy frameworks to support the move towards sustainable transport.

This chapter examines the challenges faced and identifies actions needed for improving sustainability of the transport sector in the region.

A. CHALLENGES

The Arab countries that have responded to the ESCWA questionnaire on sustainable transport have identified and ranked a group of seven challenges facing their efforts and plans to achieve sustainable transport. The ranking of the different challenges has varied from one country to the other as shown in table 3 with the most important factor being ranked as “1” and as the least important one as “7”.

TABLE 3. RANKING OF SUSTAINABLE TRANSPORT BARRIERS IN SOME ARAB COUNTRIES

Countries	Barriers and their ranking						
	Limited funding	Lack of awareness and capacity-building	Inadequate institutional and regulatory frames	Inappropriate implementation mechanisms	Lack of data and information	Weak/lack of integrated policies and plans	Lack of appropriate technical expertise
Egypt	1	7	2	3	6	4	5
Jordan	1	2	7	6	5	4	3
Lebanon	3	4	5	6	2	1	7
Palestine	1	7	3	6	4	5	2
Qatar	7	3	6	4	2	5	1
The Sudan	1	5	6	2	7	3	4
Syrian Arab Republic	1	6	7	5	2	3	4
Total score	15	34	36	32	28	25	26
Ranking of the barriers	1 st	6 th	7 th	5 th	4 th	2 nd	3 rd

From the analysis of the questionnaire responses, it is clear that the limited funds are the main barrier in moving towards sustainable transport. Lack of information, integrated policies and technical staff form the second group of main barriers, while the remaining three (awareness and capacity-building, institutional and regulatory frames, and implementation mechanism) are the least affecting barriers. It should be noted that, with the exception of Qatar, the data received comes mainly from the mixed-economy member States. The results would be completely different if responses had been received from the remaining GCC countries. The average ranking at the regional level is as follows:

1. Limited funding

The lack of financial resources is a major barrier to achieve sustainable transport in most Arab countries. The existence of a range of pressing developmental needs has given higher priority of funding to other projects, which is also associated to cases where focus is placed on single infrastructure investments or

technology-driven approaches without adequately addressing the long-term sustainable development needs of the transport sector.

2. Lack of integrated policies and plans

Sustainable transport policies and plans are not well coordinated or integrated due to the lack of inter-sectoral coordination (harmonization of policies, institutional cooperation) and limited institutional capacity to adopt, implement and further develop the transport programmes effectively. Furthermore, sustainable transport planning is inadequately integrated into urban planning, particularly of new cities, and non-motorized transport in middle-size provincial cities is poorly promoted.

3. Lack of technical expertise

Sustainable transport issues requires experience in different substantive and technical areas, in particular as related to new technologies and modalities for technology transfer. Although some positive experience could be gained in the Arab countries on several sustainable transport options, there is an essential need to enhance technical expertise in the area of new technologies either for transportation systems or for the production of cleaner fuel and upgrading of fuel specifications.

4. Lack of data and information

The development of policies, plans and even specific activities related to sustainable transport requires data and information for different public and private sectors, including transport, energy, industry, urban authorities and several others. The lack of data availability and the absence of integrated information sets represent a real challenge and require intensive efforts among the different stakeholders.

5. Inappropriate implementation mechanisms

Efforts for promoting sustainable transport need to be coordinated among all stakeholders. Moreover, technology partnerships on development in the region are very weak due to: (a) ineffective communication channels and coordination between stakeholders concerned; and (b) poor regional and international cooperation in the field of sustainable transport, which needs to be scaled up and managed with the support of both domestic and external resources and to be enhanced through international cooperation, in both the private and public sectors.

6. Lack of awareness and capacity-building

Possible negative public perception and occasional conflicting interest between the different key stakeholders as well as the absence of awareness campaigns and capacity-building programmes on the importance of achieving sustainable transport decelerate effective implementation for all stakeholders, including the public and end users.

However, building public awareness on environmental and safe mobility issues has the additional advantage of generating political support for the enactment of legislation and the allocation of funding.

7. Inadequate institutional and regulatory frameworks

In general, transport systems in the Arab region are under Government control with limited coordination among the relevant institutions. In addition, the enforcement of regulations is loose and ineffective. It is therefore necessary to establish and facilitate the required enforcement and monitoring institutions.

B. PRIORITY AREAS FOR ACTION

Economic and population growth in the Arab region led to accelerated mobility demand growth. In addition, the price subsidy for transport fuels (gasoline and diesel oil) and the inappropriate operation and maintenance of the transport fleet led to low vehicle energy efficiency and a high emission rate. Therefore, in recognition of the need to move towards a more economic and sustainable management of the transport sector, countries in the region should accelerate their efforts to implement the six proposed options presented in chapter 2 with support from regional Arab and United Nations organizations active in the region. The concerns addressed by the Arab Economic Summit in 2009 and the Arab Ministerial Declaration on Climate in 2007 should be taken into consideration (see chapter 3).

1. *At the national level*

Knowing the features of the transport sector in the Arab region, the authorities concerned in the Arab countries should consider the following priority areas of action:

- (a) Promoting and prioritizing rail and public transport, and raising the load factor of vehicles;
- (b) Improving vehicle maintenance and implementing inspection and emission test programmes;
- (c) Improving traffic and making it safer, as well as promoting safe mobility;
- (d) Developing and increasing use of cleaner fuels, especially natural gas, and improving gasoline and diesel oil specifications;
- (e) Improving urban planning and land use by making infrastructure, town planning and land use environmentally acceptable; reducing the needs for motorized transport by adopting land use planning to shorten transport distances; and improving transport infrastructure to make it more environmentally friendly.

Although there is remarkable diversity among Arab countries in terms of their transportation needs and existing transport systems, generally any sustainable transport programme should:

- (a) Respond to the rapid increase of transport demand mobility growth;
- (b) Integrate sustainable transport strategies, plans and objectives within national development strategies, policies and plans, as well as integrate sectoral transport policies within national ones;
- (c) Improve the economic management of the transport sector, since heavily subsidized energy tariffs and transport services have led to the reduction of revenues in the sector and limited the opportunities for the private investments needed to enhance its economy;
- (d) Increase the transport services accessibility to rural and remote areas, which is a prerequisite for poverty alleviation and economic and social development;
- (e) Improve energy consumption efficiency and control emissions by the transport sector;
- (f) Upgrade the marginal cooperation among stakeholders and the low level of awareness on the technologies and technology transfers available;
- (g) Strengthen and promote the currently limited regional and international cooperation on transport for sustainable development;
- (h) Mobilize funds for capacity-building, technology transfer and transport systems to meet increased transport demand.

2. *At the regional level*

Numerous challenges are involved in the implementation process of the sustainable transport options presented in this report; this process could be supported by regional organizations, particularly ESCWA,

UNEP and the League of Arab States through a series of regional expert group meetings that included discussions on the following issues:

(a) Implementation of the options proposed in this report, keeping in mind the capabilities and constraints of individual Arab countries. Such discussions would help ensure that the views of all stakeholders are represented, increasing the likelihood that the relevant sustainable transport strategies would be implemented successfully;

(b) The review and assessment of current national transport strategies in Arab countries, where they exist, for all transport modes, in particular road transport;

(c) Develop transport strategies and review existing ones, and establish strategies and plans for promoting sustainable transport in the event that a country has no such strategies yet;

(d) A review of existing policies and legislation and/or the development of new policies and the enactment of new laws to support the recommended strategies to achieve sustainable transport. Without a legal framework, some of the recommended strategies may not possibly be implemented;

(e) The facilitation of efforts to mobilize local, regional and international funds for financing high-priority sustainable transport projects in the Arab countries;

(f) The identification of areas in which capacity-building is required relating to sustainable transport and soliciting support from regional or international institutions;

(g) The organization and staging of national and regional environmental and traffic safety campaigns to increase awareness among the public and decision makers.

Implementing a sustainable transport programme is a highly complex task and, therefore, requires a coordinated approach by all players, including Governments, vehicle users, fuel producers, NGOs, and regional and international organizations. Dialogue among the various stakeholders is an important step, as is regional cooperation in any or all of the activities listed above. It is essential that international organizations can support Governments in the formulation of policies to increase investment and financial flows in sustainable transport activities and projects, and to support the development of national capacities to access and utilize resources to implement an appropriate mix of policy instruments in order to achieve sustainable transport.