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PREFACE

On the occasion of holding the World Summit on Sustainable Development (WSSD) in Johannesburg from 26 August to 4 September 2002, and in light of the lack of necessary information in Arabic regarding the strategies, policies and actions needed to achieve sustainable development in the region, the Economic and Social Commission for Western Asia (ESCWA), as a continuation to its efforts in the field, has issued a number of Briefing Papers identifying primary issues regarding sustainable development in the region. ESCWA trusts that the enclosed Briefing Papers will provide all those concerned with appropriate information on issues of vital importance to the process of achieving sustainable development in the Member States.

The Summit aims to emphasize international commitment to achieving sustainable development through:

1. Assessing implementation of Agenda 21;
2. Reviewing the challenges and opportunities to achieve sustainable development;
3. Suggesting actions and required institutional and financial arrangements to achieve sustainable development;
4. Identifying means to support institutional structures nationally and regionally.

Throughout the past years, ESCWA has incorporated the proposals set out in Agenda 21 into its various activities, especially in the fields of energy, water and environment. As a result, ESCWA has published numerous technical documents, has held various expert group meetings and has provided its Member States with technical assistance and advisory services in the field.

Within the preparations for the forthcoming WSSD, ESCWA -in collaboration with the Technical Secretariat of the Council of Arab Ministers Responsible for the Environment (CAMRE) in the League of Arab States and the United Nations Environment Programme Regional Office for West Asia (UNEP/ROWA)- has held various preparatory meetings which ultimately led to the preparation of the regional assessment report identifying the achievements and requirements of sustainable development in the Arab region, the Arab Ministerial Declaration, and the Joint Arab-African Ministerial Declaration. ESCWA has furthermore prepared a number of publications, namely; a study on sustainable development planning in the region, a regional assessment report on the achievements and constraints to sustainable development, and a study on governance and the institutional framework for achieving sustainable development in the region.

In this regards, ESCWA has issued some 18 Briefing Papers that deal with the themes that were set out in Agenda 21. The Briefing Papers could be divided into three main sections: The First Section in the Field of Energy: Contains ten papers displaying the possibilities of achieving sustainable development in the field including: (1) The ESCWA energy sector characteristics in the region; (2) Energy and Agenda 21: the objectives and progress achieved in its implementation; (3) The


challenges and opportunities for achieving a sustainable energy sector; (4) The activities undertaken by ESCWA in the field of energy and sustainable development; (5) Development of renewable energy technologies and application; (6) Efficient and rational use of energy in the building sector (domestic and commercial); (7) Efficient and rational use of energy in the industrial sector; (8) Greenhouse gas abatement in the ESCWA transport sector; (9) Greenhouse gas abatement in the ESCWA power sector; and (10) Energy and Gender perspectives in sustainable development.

The Second Section in the Field of Water: addresses the most important issues to achieving sustainable development in the water sector and the provision of sufficient water to meet the economic and social developmental needs. This section includes: (11) Water and Agenda 21, Chapter 18; (12) An integrated management of water; (13) Water supply management; and (14) Water demand management.

The Third Section in the Social and Economic Fields: takes into account the actions undertaken in the regional preparation of the WSSD and the issues of utmost social and economic concern in the region's States, including: (15) Role of ESCWA in regional preparations for the WSSD; (16) The effects of peace and security on sustainable development in the ESCWA region; (17) The effects of socioeconomic inequity on sustainable development in the ESCWA region; and (18) The effects of poverty and unemployment on sustainable development in the ESCWA region.

The abovementioned Briefing Papers were prepared by ESCWA and selected regional specialists, to be published sequentially prior to the WSSD in Johannesburg. Furthermore, ESCWA will issue a booklet containing summaries of the 18 Briefing Papers in the English version.

ESCWA trusts that these efforts contribute to shedding light on the important strategies, policies and mechanisms needed to achieve sustainable development in the region, and provide the Arab leaders, decision makers, researchers, and media persons with a simple and explicit review of the possibilities and means to achieve sustainable development, including the institutional and technical actions required for such an achievement. The Briefing Papers aim to identify priority issues to be discussed during the WSSD, and the degree to which these issues relate to the needs and perceptions of ESCWA countries, in order to assist Member States in deciding their positions towards the issues presented at the Summit and assessing the possibilities of implementing its recommendations and programmes.


Mervat Tallawy
Executive Secretary

Beirut, 16 / 4 /2002

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THE ESCWA ENERGY SECTOR CHARACTERISTICS

Executive Summary of ESCWA Briefing Paper No. 1

The ESCWA energy sector plays a vital role in achieving social and economic development in the region. However, the sector also generates adverse environmental impacts that affect its contribution to the achievement of sustainable development in the region. This paper reviews the main characteristics of the ESCWA energy sector, with emphasis placed on available reserves, production and consumption patterns as well as the energy policies and strategies that influence the sustainability of the sector and its ability to promote regional integration.

The ESCWA region enjoys immense fossil energy resources, which constituted around 56.8 per cent of the world's estimated oil reserves in the year 2000. The region also holds 19.94 per cent of the world's proven natural gas reserves. The development of natural gas reserves is increasing more rapidly than that of oil resources, which reflects the growing importance of natural gas in the energy sector. In addition, the region also enjoys vast and various renewable resources, especially hydro, solar, wind and biomass.

In the year 2000, oil production in the ESCWA region reached 7352.21 million barrels, or 27 per cent of world oil production. This is less than the region's proven capacity, which indicates the importance of the region's oil resources in satisfying future energy demand. Marketed natural gas production reached 161.9 billion m³, or 75.8 per cent of the total world natural gas production; however, only 6.68 per cent of that total was exported outside the region. The average growth rate of natural gas production in the region reached 31.6 per cent in the 1990s, compared to only 8.15 per cent grown worldwide. Renewable energy production in the region remains limited; efforts directed towards its promotion are detailed in ESCWA Briefing Paper No. 5.

Primary energy consumption in the region has reached 254.7 million tons oil equivalent (mtoe) in the year 2000, and experienced an average annual growth rate of 3.85 per cent regionally, compared to the world average of 0.9 per cent. There was a significant increase in the contribution of natural gas to regional energy consumption, which it reached 40.0 per cent in the year 2000, while the contribution of oil to regional energy consumption fell to 56.7 per cent in that the same year.

In 1999, total installed electricity capacity in the region, with the exception of Palestine, reached 78178 GWe, mostly from thermal power plants. Total generated electricity during the same year reached 334.7 thousand GWh, of which 300.7 thousand GWh were consumed by end users.

The residential, industrial and transport sectors are the major energy users in the ESCWA region. The residential sector comes first representing 55.5 per cent of total electricity consumption and 17.9 per cent of total consumption of petroleum products in

the region. By contrast, the industrial sector consumes only 26 per cent of generated electricity, but close to the same quantity of petroleum products as the residential sector by consuming 16.7 per cent of regional consumption. However, the transport sector remains the largest consumer of petroleum products, representing 43 per cent of total regional petroleum consumption, but the sector consumes very little electricity.

In 1999, average primary energy consumption in the region reached 1558 kgoe per capita, compared to the world average of 1451 kgoe. The average varied between 210 kgoe per capita in Yemen to 14800 kgoe per capita in Qatar. Meanwhile, average electricity consumption reached 2106 kwh per capita regionally, compared to the world average of 2482 kwh per capita. Primary energy intensity reached 0.522 kgoe/US\$, compared to the world average of 0.32 kgoe/US\$, which reflects the low economic return on consumed energy in the region and low energy use efficiency.

The ESCWA region is thus characterized by a large oil and gas sector and heavy reliance on thermal power generation. As a result, the sector has generated environmental impacts on air, water and land resources. CO₂ emissions from the ESCWA energy sector reached 661.0 million tons in 1999, with an average per capita share of 710 tons/year, which exceeded the world average, and an average annual growth rate of 7.7 per cent. More importantly, the CO₂/GDP ration increased steadily over the past decade, which indicates an urgent need to adopt measures to improve energy efficiency and promote the use of cleaner technologies and fuels.

Adopting measures to promote the sustainable development of the sector is sometimes constrained by the fact that the energy sector in the region is mostly publicly owned. This tends to affect development opportunities, due to the style of government management and the significant investments needed to meet increasing energy demand. As a result, Egypt, Jordan, Oman and the United Arab Emirates are moving towards forging private sector partnerships in the management and ownership of power plants.

Most energy policies in ESCWA Member States are directed towards satisfying the energy needs of development programmes and upgrading the capabilities of the sector. However, the management of the sector is not always based on economic principles, given the highly subsidized nature of energy prices in most parts of the region. This has led to economic losses and a decrease in revenues. In addition, many rural areas still lack sufficient access to energy services and supplies, which limits opportunities for their social and economic development.

Regional cooperation policies in the energy field were limited until the mid-1990s when the interconnection of electric grids was initiated between several ESCWA Member States. As of 2002, most northern countries in the ESCWA region have become part of the electricity interconnection. Efforts are now underway to establish a regional natural gas network. National policies and programs supporting the switch to natural gas as a clean fuel alternative have also achieved marked success in the electrical, industrial and transport sectors.

ENERGY AND AGENDA 21: THE OBJECTIVES AND PROGRESS ACHIEVED IN ITS IMPLEMENTATION

Executive Summary of ESCWA Briefing Paper No. 2

In 1992, the United Nations Conference on Environment and Development endorsed Agenda 21 as an international action plan for integrating the social, economic and environmental dimensions of sustainable development. While Agenda 21 does not contain a specific chapter dedicated to the energy sector, energy issues are addressed throughout the action plan with respect to a range of issues.

This paper reviews the energy related goals and activities outlined in the various chapters of Agenda 21. It subsequently assesses the progress made by ESCWA Member States over the past decade in achieving these goals and activities.

Energy related issues are addressed in several parts of Agenda 21, but primarily in Chapter 3: Combating poverty; Chapter 4: Changing consumption patterns; Chapter 7: Promoting sustainable development of human settlement; Chapter 9: Protection of the atmosphere; and Chapter 14: Promoting sustainable development for agriculture and rural areas. The goals and activities identified generally seek to strengthen the capacity of the energy sector to improve its sustainability and contribute to the realisation of sustainable development in other sectors. A number of policies and measures are also proposed that need to be developed and applied in light of prevailing local and regional circumstances.

The energy related goals and activities in Agenda 21 focus on six core areas: (1) increasing energy accessibility, particularly for rural areas; (2) improving energy production and consumption efficiencies; (3) promoting renewable energy applications; (4) enhancing the use of cleaner fuels and advanced fossil fuels technologies; (5) achieving a more efficient and cleaner transport sector; and (6) promoting regional and international cooperation in the field.

Since 1992, ESCWA Member States have directed concerted efforts towards enhancing the contribution of energy sector in achieving sustainable development. Reasonable progress has been made, but more effort is needed to achieve the objectives identified in Agenda 21. An assessment of the progress achieved in the ESCWA region over the last decade can be conducted in reference to the six core areas noted above:

Increasing energy accessibility – energy services have been increasingly extended to new groups of consumers. However, a high per centage of residents in rural and remote areas still lack access to sufficient energy resources.

Changing production and consumption patterns – some ESCWA Member States have adopted policies and programs for encouraging energy conservation and efficiency in various sectors. This has resulted in: (1) reducing the growth rates of

primary energy consumption and energy intensities; (2) improving the efficiency of electric power plants, as well as electricity transmission and distribution efficiencies; (3) supporting the preparation of several studies and energy audits, as well as conducting field testing programs on energy efficiency technologies and systems; (4) developing a database of information on the energy sector and experiences gained; (5) building specialized national bodies of expertise in the energy area; and (6) raising public awareness on the importance of appropriate energy consumption and production for sustainable development.

Promoting renewable energy applications – progress has been achieved in promoting the use of renewable energy technologies in the ESCWA region. These accomplishments are detailed in ESCWA Briefing Paper No. 5.

Introducing cleaner fuels and technologies – the last decade witnessed an increase in the share of natural gas in the energy mix of ESCWA Member States, which reached up to 40 per cent of the total energy consumption in the region in 1999. Moreover, some renewable energy systems have been commercialised. The use of combined-cycle electricity generation systems has also become more widespread in the electric power sector.

Energy and transport – ESCWA Member States have developed national greenhouse gases inventories for different sectors, including the transport sector. The use of unleaded gasoline has increased in the region. In Egypt, a national policy and incentive program in Cairo supported a switch to natural gas vehicles; up to 27000 of such vehicles are already in use. Pilot projects to use fuel cells for buses are also under consideration in some parts of the region.

Promoting regional cooperation – the 1990s witnessed noticeable progress in regional cooperation in the energy sector. This is manifest by the realisation of a regional electricity grid interconnection between some northern ESCWA countries. Countries in the Gulf sub-region are also considering a project to connect their electricity grids. In addition, natural gas networking projects between ESCWA Member States are being studied, with feasibility studies including the preparation of environmental impact assessments.

THE CHALLENGES AND OPPORTUNITIES FOR ACHIEVING A SUSTAINABLE ENERGY SECTOR

Executive Summary of ESCWA Briefing Paper No. 3

Sustainable development efforts to eradicate poverty, improving living standards and conserve natural resources must be balanced against high rates of population growth, shrinking natural resources and the structure of economic growth and development in the ESCWA region. This paper examines the challenges facing the sustainable development of the energy sector in the ESCWA region and identifies opportunities for improving the contribution of the energy sector to sustainable development in the region.

Efforts made by ESCWA Member States over the last decade to achieve sustainable development were constrained by several factors. These included: (1) the lack of integration of sustainable development strategies with reference to energy planning, including the contribution of clean and renewable energy relative to the role of classical energy resources; (2) the inappropriate allocation of investment funds in the energy sector in favour of traditional energy resources and the limited regional coordination in project financing, which has led to over-reliance on foreign financing schemes; and (3) the unfavourable environment in which attempts for achieving sustainable energy development took place, which is attributable to limited institutional support, marginal cooperation among stakeholders, low level of awareness on available opportunities and technologies, and limited local industrial support for after sale services.

Achieving sustainable development requires energy producers and consumers to consider a variety of measures for enhancing the contribution and reducing the impact of the energy sector on sustainable development. On the supply side, this may include extending national electricity networks, supporting regional electricity interconnections, improving the mix of energy resources to include renewable energy, and increasing the use of natural gas. Scientific research in clean technologies should also be supported.

On the demand side, there is a need to increase awareness among residential and industrial consumers about energy efficiency and to develop incentives for industries to switch to cleaner, more energy efficient modes of production. Measure to increase the efficiency of the transport sector should also be considered. Improving sustainable energy consumption may also mean the gradual removal of energy subsidies for residential, industrial and agricultural consumers. The adoption and enforcement of standards and specifications for energy devices and systems are also needed.

The promotion of sustainable energy production and consumption should also include private sector investment opportunities and technology transfer arrangements.

Available opportunities for sustainable energy development in the region include an:

- (1) *International support regarding the importance of energy supplies* – there is overwhelming agreement worldwide that poverty eradication and the development of sustainable societies are among the most central of sustainable development goals. However, there is also consensus that achieving these goals requires access to and availability of energy supplies, as well as the provision of financial and technical assistance, particularly in the fields of renewable energy resources and natural gas;
- (2) *Regional cooperation* – the realisation of sustainable energy development in the region necessitates agreements among ESCWA Member States, commitments to decisions taken within regional mechanisms on energy related matters, as well as efforts to secure assistance and support from regional organizations;
- (3) *Regional energy integration programmes* – remarkable progress has been made in the execution of regional electricity interconnection projects and natural gas networking. Many ESCWA member countries also share common goals that seek to increase reliance on natural gas and renewable energy and to improve electricity supplies to rural areas in order to support sustainable development.

The realisation of sustainable development requires cooperation among local, national and regional stakeholders. There is also a role for inter-regional cooperation, assistance provided United Nations organisations, and services provided by international financing agencies. Through co-operation and partnerships, efforts should be made to support:

- (1) *Financing schemes* – to increase access to loans and grants and to encourage private sector investment in energy projects. Arrangements are needed to reduce financial risks, attract foreign direct investment and propose appropriate incentives and flexible loans arrangements;
- (2) *Capacity building and technology transfer* – international organisation and donor agencies are called upon to: (i) develop capacity building and technology transfer programmes, especially in the fields of renewable energy and energy efficiency; (ii) support and encourage research and development in collaboration with industrialised nations; (iii) provide support to developing countries to enable them comply with relevant international treaties and protocols; (iv) increase the quality and quantity of financing offers; and (v) introduce policies to engage the private sector in common or complementary energy initiatives;
- (3) *Regional and international cooperation* – more attention should be focused on promoting regional integration among ESCWA Member States, particularly on issues related to sustainable development. Regional and international cooperation is also needed in the areas of financial and technical assistance.

THE ACTIVITIES UNDERTAKEN BY ESCWA IN THE FIELD OF ENERGY AND SUSTAINABLE DEVELOPMENT

Executive Summary of ESCWA Briefing Paper No. 4

This paper discusses the core themes and objectives of ESCWA programmes in the field of energy as related to sustainable development. It also reviews the activities undertaken by ESCWA over the past decade to support the development of a sustainable energy sector in the region within the framework of Agenda 21.

The overall orientation of ESCWA programmes in the field of energy is to enhance the role of the energy sector in the region in promoting sustainable development through integrated approaches as well as to facilitate regional integration in the energy field. ESCWA activities on energy are identified in consultation with the ESCWA Committee on Energy, which is an intergovernmental body composed of representatives from ESCWA Member States. The Committee helps to identify the priority areas for examination on energy resources in the region and reviews the progress achieved by ESCWA in implementing identified actions.

The main programme areas on energy being implemented by ESCWA address: (1) energy efficiency and conservation; (2) renewable energy applications; (3) energy and the environment; (4) energy sector integration and reform; and (5) energy for water desalination. In line with these thematic areas, ESCWA activities within the energy field support sustainable development efforts and are mainly directed towards:

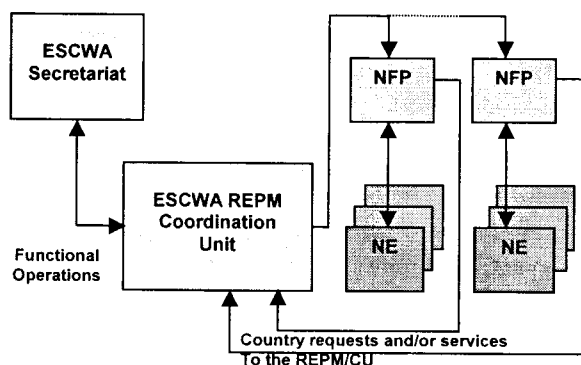
- Preparing studies on the regional energy situation and regional energy trends;
- Disseminating energy relevant information, by organizing expert group meetings, workshops and training courses;
- Monitoring developments in the fields of energy conservation and renewable energy technologies and promoting their application in the region;
- Preparing assessments on regional electricity networks, privatisation efforts, natural gas networking projects, and prospects for inter-regional cooperation;
- Identifying and evaluating policies and technological options for promoting efficient energy use, particularly in the building, industrial and transport sectors;
- Assessing and evaluating the environmental impacts of the energy sector, particularly with regards to greenhouse gases, and prioritising measures and technologies for alleviating the environmental impacts of the sector;
- Providing technical assistance to ESCWA member countries on different energy issues and developing proposals for field projects; and
- Assessing and evaluating energy options for water desalination.

The ESCWA work programme on energy has included activities related to Agenda 21 objectives since 1992. However, more focus was placed on supporting the sustainability of the sector in the Medium Term Plan for 1998-2001. The current

Medium Term Plan for 2002-2005 emphasizes the need for integrated approaches for achieving energy sector sustainability.

The paper outlines the activities undertaken by ESCWA on energy issues over the past decade and examines their outcomes. The review is organised according to the thematic areas of the work programme and various activities focusing on (1) energy efficiency improvement; (2) renewable energy promotion; (3) abatement of the environmental impacts of the energy sector; (4) regional integration and cooperation; (5) capacity building; and (6) technical cooperation.

For instance, in an effort to promoting greater regional cooperation, ESCWA launched the Renewable Energy Promotion Mechanism (REPM) in October 2000. The core objective of the REPM is to foster sub-regional and regional cooperation among ESCWA member countries based on national capabilities and mutual benefits. International partners are also involved to accelerate the field application of renewable energy opportunities and energy conservation technologies.



The diagram to the left illustrates the administrative structure of the REPM. The REPM operates through National Focal Points (NFPs) and National Entities (NEs), with ESCWA acting as the coordination unit.

For additional information see: <http://www.escwa.org.lb> or contact:

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DEVELOPMENT OF RENEWABLE ENERGY TECHNOLOGIES AND APPLICATION

Executive Summary of ESCWA Briefing Paper No. 5

The issues and objectives identified in Agenda 21, particularly on combating poverty, promoting sustainable agriculture, developing rural areas and protecting the atmosphere, emphasize the need to develop a balanced mix of fossil fuels and renewable energy resources and to reduce the adverse impacts of the energy sector on the environment. In view of this call for action, this paper addresses the need for and the benefits of promoting renewable energy applications in the ESCWA region. It also reviews advancements in the field of renewable energy technologies, progress achieved in developing indigenous technologies and applications, the obstacles facing the sector, as well as the potential for investing in renewable energy applications in the region.

High levels of hydro, solar, wind and biomass resources are available in the ESCWA region at utilisable levels. The use of these renewable energy resources should be promoted as they can contribute to: (1) diversifying the energy mix; (2) increasing energy accessibility; (3) combating poverty; (4) improving the quality of life for women; (5) facilitating water desalination in remote areas; and (6) protecting the environment.

Currently, several renewable energy technologies have reached or are approaching maturity and can be utilized for both small-scale and large-scale applications. This is particularly true in the field of electricity generation. In 2001, the annual world production of photovoltaic (PV) panels reached over 390.0 Mwp, with a growth rate of 38.0 per cent between 1995 and 2001. The current cost of generating electricity using PV panels is US\$ 0.20 to US\$ 0.60 per kwh. It is expected that the PV market will reach 1710.0 Mwp by 2010. Solar thermal electricity generating plants are also now developed for large-scale applications, with more than 400 Mwe currently installed. The cost of solar thermal generated electricity currently is US\$ 0.08 to US\$ 0.12 per kwh, depending on plant type and the level of solar irradiation on site. The cost is expected to drop by half to US\$ 0.04 to US\$ 0.06 per kwh by 2010. Wind electric systems have also advanced, with the scale of a single wind turbine reaching 600-750 kwe. World installed wind power capacity reached 24471 Mwe in early 2002, and enjoys a 38.2 per cent annual growth rate. In sites with strong winds, the cost of generated electricity varies between US\$ 0.04 to US\$ 0.6 per kwh, and is expected to fall to US\$ 0.027 to US\$ 0.032 per kwh by 2020.

Member countries of the ESCWA region have undertaken, with various degrees of success, different programmes for developing and promoting solar thermal, photovoltaic, wind and biomass technologies. Some core achievements are listed below:

- Egypt, Jordan and Syria adopted national strategies that seek to increase the contribution of renewable energy in the energy mix to three to five per cent of total production by 2010 and have established specialized renewable energy

institutions to help achieve this goal. Other ESCWA Member States have entrusted existing bodies with mandates to examine renewable energy alternatives;

- Renewable energy topics have been introduced into educational curricula at various levels;
- A wide spectrum of research and development activities, assessments and pre-market studies were completed to identify appropriate application potentials of various renewable energy technologies in the region;
- Standard specifications were issued for solar water heaters, with testing and certification facilities established in Egypt, Jordan, Syria and Saudi Arabia, but at different levels of advancement;
- Local industries have been established to produce solar water heaters in several member countries;
- The manufacture of the blades and towers of electric wind turbines with 100 to 600 kw capacity is well developed in Egypt;
- Almost all renewable technologies have been demonstrated and tested in different field conditions in the region. The experience gained has strengthened local capabilities and initiated the development of databases; and
- Currently, 500,000 solar water heaters and 75.0 Mw of wind systems are in operation in the region. In Egypt, the 63.0 Mw Zafarana wind farm is producing and selling electricity to the national grid. In addition, Egypt and Jordan are taking serious steps for establishing solar thermal power plants integrated with natural gas combined cycle systems. An Egyptian plant with a capacity of 126 Mwe is expected to start operations in 2004 or 2005.

ESCWA studies show that the potential applications of renewable energy technologies in the region by 2010 could reach 1720 Mwe by solar thermal combined cycle plants, about 22 to 33 Mwe by photovoltaic systems of different types and around 800 Mwe by wind farms. However, the adoption of renewable energy alternatives in the region still faces several barriers. This is because: (1) renewable energy policies and strategies are not yet integrated into national energy policies; (2) financial resources for renewable energy investments remains limited; (3) coordination of efforts and experiences between concerned parties is weak; (4) databases are inadequate; (5) technology transfer and local manufacture activities are insufficient; and because (6) capacity building programmes are limited.

It is clear that renewable energy technologies have great potential for contributing to a sustainable energy mix in the ESCWA region. However, more action is needed and should include: (1) integrating renewable energy policies into national energy policies with defined and targeted contributions; (2) strengthening relevant national institutions; (3) encouraging renewable energy technology transfer and supporting local industries seeking to develop or use renewable energy technologies; (4) enhancing resource assessment activities for wind and biomass; (5) intensifying capacity building and public awareness programmes; and (6) initiating new financial mechanisms for supporting renewable energy adopting, particularly in rural areas.

EFFICIENT AND NATIONAL USE OF ENERGY IN THE BUILDING SECTOR (DOMESTIC AND COMMERCIAL)

Executive Summary of ESCWA Briefing Paper No. 6

The building sector (residential and commercial) in the ESCWA region is the most consuming sector of energy in general and electricity in particular. It is difficult to predict and control future energy demand in this sector because of the economic, social, geographic and climatic factors that influence its development and growth. Recent studies demonstrate that the appropriate design of building and the use of efficient energy systems can reduce energy consumption in buildings without compromising comfort standards. This paper focuses on the state of energy consumption in the building sector in ESCWA member countries, the opportunities for energy conservation, potential applications and advancements made in the field.

In 1999, the building sector in the region consumed more than 167 GWh of electricity, representing 54.4 per cent of gross sectoral electric energy consumption. This sector also consumed 22.19 million toe of petroleum products, which represented 17.4 per cent of gross sectoral consumption of petroleum products in the region. National consumption of energy in the building sector varies considerably from one place to another and depends upon local circumstances. However, consumption is high and inefficient, which may be attributed to low energy prices, government subsidies and the hot climate in the region that necessitates the use of air conditioning during long periods of the year. In view of these conditions, per capita energy and electricity consumption in 1999 reached 4800 Kgoe/year (average per capita consumption of 1558 Kgoe/year) and 14000 kWh/year (average per capita consumption of 2106 kWh/year) respectively. The need for conserving energy and improving its efficient utilisation in the region has thus become an urgent matter.

The various elements of a building's energy system affect one another. Energy conservation considerations should thus be examined throughout the building system and can be classified into three categories: (1) *building related measures*, which includes provisions for environmentally friendly architecture and materials, as well as the construction of thermal envelopes; (2) *measures related to technologies and efficient systems*, of which examples include analysis and replacement of more efficient lighting, heating, cooling, water heating and refrigeration systems; and (3) *efficient management of equipment and energy systems*, which envisages more efficient management of lighting, air conditioning, heating, water heating and cooling systems.

Many of the measures discussed above are applicable in the ESCWA region, depending on local conditions in each country. The selection of the most appropriate measure depends on the following criteria: (1) the local and regional market for the intended application; (2) the savings resulting from the application of the adopted measure as compared to other measures; (3) the availability of technology and related expertise; (4) the suitability of technology cost vis-à-vis local living standards; and (5)

the capital investment and length of the payback period. Based on these criteria, priority measures for speeding-up the introduction of energy efficiency and conservation practices in the building sector in the region should support: (1) thermal insulation of buildings; (2) high energy efficient lighting; and (3) efficient management of equipment and energy systems.

Despite the fact that concerted efforts have been made by some ESCWA member countries in the field of energy efficiency and conservation, the progress made in the building sector remains below desired levels. However, some progress has been achieved in:

1. *Environmentally friendly architecture and thermal insulation of buildings* – specifications have been developed for the thermal insulation of buildings and were integrated into building laws in some ESCWA member countries. Serious efforts are also being made by public agencies and non-governmental organisations in Egypt and Lebanon to promote environmentally friendly architectural concepts and to develop specifications and codes for that purpose.
2. *Efficient technologies and energy systems* – several projects were executed and many are underway in the field of solar water heating systems. 500,000 solar water heating systems have been already installed in the ESCWA region, mostly in Egypt, Jordan and Syria. Other success stories include promotion of efficient lighting systems in Egypt and Lebanon, efficient household equipment in Egypt, and promotion of energy efficiency and conservation policies.

Accordingly, in order to support the ongoing efforts in the field of energy efficiency and conservation in the building sector, the following measures are recommended:

1. *Specifications and laws* – this would involve: (i) applying equipment and systems specifications on both local and imported products; (ii) formulating appropriate legislation to help consumers choose the right equipment; (iii) adopting a time-of-use tariffication structure; and (iv) encouraging private sector investment in energy efficiency and conservation projects.
2. *Public awareness and national capacity building* – this would involve: (i) developing local industries to produce energy efficient equipment and systems; (ii) improving the skills of engineers in the field of energy efficiency; (iii) carrying out public awareness programmes on energy efficiency and conservation; (iv) ensuring government commitment to finance energy conservation projects and awareness campaigns; and (v) facilitating access to financing from public and private financial institutions for energy efficiency investments.

EFFICIENT AND RATIONAL USE OF ENERGY IN THE INDUSTRIAL SECTOR

Executive Summary of ESCWA Briefing Paper No. 7

The industrial sector is one of the most energy consuming sectors in the ESCWA region, especially in member countries with diversified economies. Additionally, most industrial processes are characterised by low energy consumption efficiency, which indicates that there are significant opportunities for improving energy efficiency in the sector. This paper briefly describes the characteristics of energy consumption in the industrial sector of ESCWA Member States, identifies energy efficiency options suitable for industry, and highlights policy measures for successfully implementing these alternatives.

The ESCWA industrial sector is characterised by the diverse nature of its products and production methods. As such, major industries in the region can be classified into the following sectors: basic metal industries; fabricated metals and machinery; chemicals; textiles; food; stone; clay; and ceramics. Manufacturing industries can also be organised according to their level of energy consumption, which can be classified as high, medium or low.

In 1999/2000, the industrial sector consumed 79.6 mtoe of primary energy, which represented around 27 per cent of total primary energy consumption in the region. This included the consumption of 78200 GWh of electricity and the utilisation of 20.689 mtoe of petroleum products. The contribution of natural gas was estimated at 39.4 mtoe, which represented 40 per cent of total natural gas consumption in the region. In addition, average annual demand growth for the industrial sectors in ESCWA Member States is estimated to run 7 per cent between 1995 to 2010, while the world average annual growth rate stands at only 2 per cent. The increasing levels of energy use generated CO₂ emissions amounting to 290 million tons in 2000, which represents 39 per cent of total CO₂ emissions resulting from regional energy consumption.

Energy is a major factor influencing the per unit cost of an industrial product. The industrial energy efficiency indicator reached 1.49 kgoe/US\$ in 1999, accounting for almost 2.7 times the average primary energy intensity in the region. This reflects poor energy utilization efficiency in the sector and the pressing need for improvement.

Several policies have been identified for changing unsustainable energy consumption patterns in the region and for promoting energy efficiency in industry. These measures seek to: (1) support integration between general energy policies and those specifically implemented by the industrial sectors; (2) support programmes responsible for setting specifications for devices, machines and systems used in industry, as well as their testing procedures; (3) encourage capacity building programmes related to energy audits and energy efficient systems for industry; and (4)

provide support for national industries, by improving their capabilities for transferring energy efficient technologies and establishing energy services companies (ESCOs).

The technologies and systems for improving energy efficiency that are now widely available in the region include: (1) industrial process control; (2) waste heat recovery (WHR); (3) combustion efficiency improvement mechanisms; (4) energy management systems (EMS); (5) cogeneration; (6) power factor improvements; (7) high efficiency lighting, (8) high efficiency motors; and (9) insulation and refractory systems.

Studies prepared by ESCWA reveal that the recommended procedure to evaluate and select priority energy efficiency options includes the following steps: (1) identifying a major industrial process for examination; (2) establishing the potential net savings in energy consumption obtained as a result of implementing energy efficiency measures and technologies; (3) qualifying the technological options for upgrading energy efficiency; and (4) screening and selecting options in accordance with the characteristics of targeted industries and available funding. Based on this method, the most successful energy efficiency options that can be adopted by most industries in the ESCWA region may be ranked as follows: (1) combined heat and power systems; (2) combustion efficiency improvements; (3) waste heat recovery; and (4) energy management systems.

During the last decade, national energy centres, in collaboration with donor agencies, have contributed to the advancement of energy efficiency projects in the region. As a case example, the paper briefly summarizes the progress made in the Egyptian industrial sector where energy audits were conducted in more than 100 public and private industrial facilities. The audits recommended a wide variety of measures for improving energy efficiency. More than 35 capital investment projects were subsequently implemented to illustrate the application and benefits of different available technologies including cogeneration, waste heat recovery, combustion control and efficient lighting.

Finally, the adoption of the following measures should be considered in order to realise sustainable industrial development in ESCWA Member States: (1) national institutions and concerned regional and international organisations should continue efforts to implement Agenda 21 objectives and to follow up on the outcomes of the World Summit on Sustainable Development; (2) industrial establishments should establish a unit for energy planning at each plant or subcontract this task to an ESCO; and (3) government decision-makers should establish a directorate for energy planning in the concerned ministry to carry out studies and design plans aiming at improving energy efficiency in the industrial sector.

GREENHOUSE GAS ABATEMENT IN THE ESCWA TRANSPORT SECTOR

Executive Summary of ESCWA Briefing Paper No. 8

The transport sector plays a vital role in facilitating social and economic development in the ESCWA region. However, the sector also imposes significant environmental impacts on air, water and land resources, particularly due to greenhouse gas (GHG) emissions. This paper reviews the structure of the transport sector in the ESCWA region, estimates the level of GHG emissions from the sector, discusses priority options to abate these gases and suggests measures and actions to support their successful implementation in order to achieve sustainability of the transport sector within the framework of Agenda 21.

Road transportation dominates all modes of transport and consumes the most energy produced by petroleum products in the region. This has had important implications for the environment. In 2000, there were over 16.67 million motor vehicles registered in the ESCWA region, excluding motorcycles. The distribution and ownership rates vary significantly amongst ESCWA countries and range from 1.9 persons/vehicle in Qatar to up to 28.2 persons/vehicles in Syria and Egypt, which results in a regional average of around 15.7 persons/vehicle. In some major cities of the region, 60 to 65 per cent of cars are more than 10 years old and 25 per cent are more than 20 years old. The sector is also characterised by growing traffic congestion, especially in major cities of the region. This may be attributed to subsidised fuel prices in most countries, the high dependence on private vehicles and lack of adequate public transport.

In 1999 the sector consumed around 55.375 million tons of petroleum products with the share of gasoline topping 73.3 per cent and diesel representing 26.7 per cent. In 2000, it was estimated that the ESCWA transport sector emitted around 712.9 million tons of CO₂, with per capita emissions varying between 0.21 tons/capita in Syria to 4.63 tons/capita in Kuwait.

This briefing note reviews the recommended guidelines of the United Nations Framework Convention on Climate Change (UNFCCC) on technologies and policies for reducing GHG emissions from the transport sector. These include: (1) deploying advanced and less polluting technologies (such as electric vehicles, fuel cells, and hybrid electric vehicles); (2) shifting towards cleaner and reformulated fuels (such as natural gas, ethanol, oxygenated fuels); (3) promoting the use of public transport and enforcing enhanced traffic management; (4) supporting urban planning and land use strategies; and (5) establishing environmental regulations and standards as an effective tool for emissions reduction.

Based on the prevailing conditions in the region and the GHG mitigation options listed above, the brief identifies and applies evaluation criteria for priority ranking these options by evaluating the effectiveness of the GHG reduction option,

capital costs, operation and maintenance costs, implementation difficulties, replication potential, non-environmental benefits and sustainability. Based on these criteria, the priority measures identified for consideration in the region seek to: (1) improve vehicle maintenance; (2) introduce natural gas vehicle technology; (3) restrict private car ownership and its use; (4) promote the use of public transportation systems; (5) improve traffic management; (6) improve urban planning and land use; and (7) develop environmental standards and regulations. However, the implementation of these abatement strategies is faced by a number of challenges that need to be overcome, such as the lack of financial resources, the lack of strategies and policies, and the lack of regional cooperation amongst member states.

Several ESCWA countries have achieved progress in reducing GHG emissions from the transport sector. Egypt, Jordan and Lebanon submitted their GHG inventories to the Inter-governmental Panel on Climate Change (IPCC). The government of Egypt enforces a regular maintenance and inspection programme on vehicles, supports the enlargement of the national natural gas vehicle fleet, and encourages the use of unleaded gasoline. The Lebanese government also encourages the use of unleaded gasoline by offering a financial subsidy, which resulted in an 80 per cent increase in sales and prohibited by law the use of diesel oil in certain vehicles. The government of Jordan provided taxi owners with a tax exemption if they replaced their old cars with new models. Road networks have also significantly improved in Lebanon and Egypt to reduce traffic congestion.

As such, the following set of national and regional actions and activities are recommended in order to reduce GHG emissions and encourage the sustainability of the transport sector. These include recommendations:

- To develop national and regional strategies and policies for the sustainability of the sector in line with targets and guidelines laid out in the United Nations Framework Convention on Climate Change and Agenda 21;
- To provide and secure funding from international organizations and more wealthy countries within the region to finance the GHG abatement options;
- To conduct capacity building activities related to the monitoring and control of emissions from the transport sector, and to increase public awareness; and
- To develop and harmonise legislation and standards in ESCWA Member States and to develop and maintain regional cooperation in the field of energy in general and the transport sector in particular.

GREENHOUSE GAS ABATEMENT IN THE ESCWA POWER SECTOR

Executive Summary of ESCWA Briefing Paper No. 9

Despite the vital role of the power sector in the economic and social development of the ESCWA region, the sector is contributing to global environmental pollution particularly due to greenhouse gas (GHG) emissions that lead to climate change. Because of the need to achieve sustainability of the power sector within the framework of Agenda 21, this paper reviews the structure of the power sector in the ESCWA region, estimates the level of GHG emissions produced by the sector and discusses priority abatement options and means for implementation.

Electric utilities in ESCWA Member States are experiencing rapid growth in demand for electricity, which is partially stimulated by subsidised energy prices. The total installed capacity in the region is expected to increase from 84,764 MW in 2000 to 129,158 MW in 2010. The largest generating units are thermal, which in 1999 accounted for 88.3 per cent of total installed capacity. On the other hand, the transmission of electric power in ESCWA member countries is carried out at voltage levels ranging from 33 kV to 500 kV over an overall length of 170,000 km. Due to low investments in maintenance and technology upgrading, networks suffer from high technical losses, which range from 14 to 22 per cent compared to 10 per cent in industrialised countries.

The total amount of electricity generated by ESCWA Member States in the year 2000 reached 340,921 GWh, with an average annual growth rate of 1.88 per cent. However, total electricity consumption rose at a much faster rate of around 6.9 per cent annually and reached 330,613 GWh in 2000. The average annual per capita consumption rate in 1999 was around 2,106 kWh, whereas the world average annual rate was 2,482 kWh. In 2000, the power sectors in ESCWA member countries consumed over 80.3 million toe, accounting for around 31.5 per cent of the total energy consumed in the region. In that same year, the corresponding level of specific energy consumption and efficiency were 0.263 kg/kWh and 38 per cent, respectively. In 2000, CO₂ emissions from the ESCWA power sector totalled 245 million tons, with an average per capita emission rate of 1.4 tons/year, compared to the world's average of 1.65 tons/year.

International agreements, such as the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, outline suggested technologies and measures for controlling national GHG emissions by 2008 at a level five per cent below 1990 levels. This brief reviews these measures, which include: upgrading generation efficiencies through deployment of combined cycle systems, combined heat and power systems, system rehabilitation and boiler tuning, electric grid interconnection and load management, switching to cleaner technologies (such as natural gas and renewable energy resources), demand side management approaches, pricing policies and privatisation options. However, mitigation strategies applicable to ESCWA member countries depend on the national energy profile and emissions situation. Consequently,

and due to large differences in the energy situations amongst ESCWA Member States, selection criteria were formulated for assessing a range of options that target the supply-side and the demand-side alternatives.

The selection criteria formulated include: GHG reduction potential; efficiency improvement; energy savings; investment level; the length of the payback period; the potential to replicate the approach; the sustainability of the option; and non-environmental benefits. The adopted ranking reviewed priority measures for the power should focus on: (1) developing the regional electric interconnection; (2) deploying combined cycle units; (3) switching to cleaner energy resources; (4) pursuing boiler improvements; (5) adopting demand-side management programmes; (6) reducing/phasing out energy subsidies; and (7) reducing transition and distribution losses.

A number of projects and policies have been implemented in some ESCWA member countries that aim to improve electric power generation efficiency and hence reduce GHG emissions. Some of these projects include the completion of a sub-regional electric interconnection project initiated between six member countries, in addition to bilateral agreements between Egypt and Jordan and between Syria and Jordan to support the network. A project is also under consideration to connect the countries of the Gulf Co-operation Council. Combined cycle systems have been installed in several member countries yielding a total capacity of 7686 MW, which constitute around 9.1 per cent of the total installed power of the region. Demand side management and rehabilitation programmes have been established in several countries to improve operational efficiency and to reduce GHG emissions. Other projects also include switching to natural gas as the main fuel for power generation (e.g., in Egypt, Jordan), deploying renewable energy resources (e.g., in Egypt and Jordan), and establishing regulations and standards for power plant operations and emissions.

Finally, the brief shows that governments and electric utilities in the ESCWA region have a wide scope of options available to them to control GHG emissions. Implementing these options would also lead to enhancing system efficiencies and upgrading management strategies that would reduce costs. Abatement strategies to achieve this goals should thus focus on: (1) sector sustainability through the adoption of new and cleaner technologies to be implemented in production expansion programs; (2) expanding the regional electric grid and gas network to cover most of the region; (3) siting new power generation units close to natural gas sources; (4) developing new policies, standards, quality norms, and codes of practice to enhance the sector's sustainability; and (5) developing programs and incentives to deploy renewable energy resources in electric power generation, especially in remote areas.

ENERGY AND GENDER PERSPECTIVES IN SUSTAINABLE DEVELOPMENT

Executive Summary of Briefing Paper No. 10

This paper discusses the interrelation between the gender perspective and energy issues in the ESCWA region within the framework of sustainable development measures articulated in Agenda 21, the Beijing Declaration and the goals laid out in the Millennium Declaration. It also presents the main barriers facing the ESCWA energy sector in achieving equal access for women to sustainable and affordable energy services. Finally the paper recommends a set of energy policies and actions that can facilitate the incorporation of gender perspectives into sustainable energy policies and plans in the ESCWA member countries.

In the year 2000, women counted for 52 per cent of population of the ESCWA region, while in rural areas women accounted for 43.4 per cent of the population, although their share of rural population varies greatly between countries. The status of women in the region has markedly advanced over the last two decades, but their educational, health and employment conditions and opportunities still lag behind that of men, particularly in poor urban and rural areas.

Some of the urban poor and the majority of rural populations in the ESCWA region are living in areas with limited or no access to appropriate energy supplies and services, particularly electricity. This situation leads to difficult living, health and economic conditions, which limits possibilities for poverty alleviation and hinders sustainable development. This is because women in rural areas: (1) carry the heavy burden of collecting and using non-commercial fuels, which severely effects their health and that of the children; (2) lack income generating opportunities; and (3) keep their daughters from going to school in order to help them in the home, which affects the advancement of women. Moreover, the lack of energy services represents a constraint for economic development for both men and women and limits job opportunities. As a result, men tend to immigrate to big cities while women remain behind to care for the family.

In addition, the energy policies in the region do not give due consideration for gender perspectives. The opportunities to achieve gender equality and sustainable development for women are thus confronted by a set of barriers, which includes the: (1) lack of access to electricity; (2) limited awareness of available alternative energy supply options, including renewable energy technologies; (3) reluctance of the private sector to invest in energy services for the poor; and (4) unavailability of statistical information and assessment studies on gender energy issues.

Over the last decade, limited progress was achieved in the ESCWA region in implementing the objective set in Agenda 21, the Beijing Declaration and the Millennium Declaration regarding the integration of gender perspectives into energy

policy and planning processes. In order to further promote the status of women and enhance sustainable development opportunities through increased access to sustainable energy systems, the following recommendations are proposed:

- To increase access to different energy supplies and services for all people, with particular emphasis on rural energy need and the allocation of energy for productive uses and income generation opportunities;
- To emphasise the development of small-scale stand-alone electric power systems, particularly those based on renewable energy resources;
- To encourage the promotion of simple, efficient energy technologies, particularly those which can be manufactured locally;
- To establish innovative financial mechanisms for financing energy systems, particularly those that assist small businesses; and
- To promote the development of statistical databases and assessment studies for the evaluation of gender issues relevant to energy planning, and to analyse energy projects in terms of their involvement with and impacts on women and sustainable development.

WATER AND AGENDA 21
ASSESSMENT OF THE PROGRESS ACHIEVED BY ESCWA COUNTRIES IN
IMPLEMENTING CHAPTER 18 OF AGENDA 21

Executive Summary of ESCWA Briefing Paper No. 11

This briefing paper reviews the work program that comprises Chapter 18 of Agenda 21, which deals with protecting the quality and supply of freshwater resources. The paper identifies the main challenges facing the sector in the ESCWA region and proposes recommendations for responding to these challenges.

Chapter 18 outlines seven programmes of work to achieve the goal of protecting the world's freshwater resources, namely:

- Integrated water resources management (IWRM) and development;
- Water resources assessment;
- Protection of water resources, water quality and aquatic ecosystems;
- Drinking water supply and sanitation;
- Water and sustainable urban development;
- Water for sustainable food production and rural development; and
- Impact of climate change on water resources.

For each programme of work, specific objectives are identified along with activities to achieve them, financial mechanisms as well as other requirements for implementation.

ESCWA member countries face significant challenges related to water quality and quantity. These include:

- Scarcity due to natural conditions;
- Social pressures, which are leading to rapidly growing demands on scarce resources and increased pollution;
- Management shortcomings, including inadequate coordination, decentralisation, enforcement, etc.;
- Technical constraints, due to the availability of data on supplies, end use, etc.;
- Economic pressures, which affect the ability to secure sufficient finance for development of the sector; and
- Political issues, related to internationally shared water resources.

Several recommendations might be considered to address the problems noted above. These include the:

- Need for more efforts to apply concepts of IWRM;
- Review of agricultural policies to objectively find an appropriate balance between measures seeking to address water scarcity and achieve food security;
- Development of a positive attitude towards “cost recovery;”

- Need to set water tariffs such that they generate sufficient revenues for the operation and maintenance of utilities and provide an incentive for water conservation;
- Advantages of encouraging a larger role for the private sector in the delivery of water services;
- Importance of adopting measures to support water demand management, such as setting water tariffs for irrigation water, social acceptance of water recycling;
- Adoption of measures to improve and increase water supply, such as the rehabilitation of supply networks and artificial recharge of groundwater aquifers;
- Adoption of national programs for the protection of groundwater from pollution;
- Support for water recycling and reuse of treated wastewater as suitable alternatives;
- Intensification of awareness programs to address social constraints hindering the implementation of various measures for demand management;
- Development of the institutional and legislative frameworks; and
- Strengthening of cooperation between riparian states.

INTEGRATED WATER RESOURCES MANAGEMENT

Executive Summary of ESCWA Briefing Paper No. 12

Integrated water resources management (IWRM) calls for the integrated management of land and water resources and other related natural resources in a coordinated approach that aims to maximize socio-economic welfare in an equitable manner without sacrificing the sustainability of the ecological systems. This paper examines the progress achieved in implementing the IWRM principles in the ESCWA region, outlines the main challenges facing the sector and offers recommendations.

IWRM tools are grouped into three main categories, namely the:

- *Enabling environment* – which consists of three sets of tools; namely: policies, legislation and financing structures;
- *Institutional roles* – which consist of two sets of tools, namely the organizational framework and institutional capacity building for developing human resources; and
- *Management instruments* – which consist of eight sets of tools, namely: water resources assessment, plans for IWRM, demand management, social change instruments, conflict resolution, regulatory instrument, regulatory instruments, economic instruments and information management and exchange;

Several challenges confront the water sector in the ESCWA region. Eight main challenges are listed below, followed by recommendations for addressing each problem:

1. *Meeting the basic water supply needs of the society* – recommendations: provide an adequate and safe domestic water supply and sanitation at affordable prices; provide good quality water supply for the next 50 or 100 years; fully or partially meet water supply by desalination, with adequate water tariffs and investment in research and development; and reduce costs and the environmental impact.
2. *Risk management* – recommendations: undertake structural and non-structural measures for flood control in urban and rural areas; undertake adequate monitoring of hydrological phenomenon; increase drought preparedness and provide for potential impact of climate change on water resources; routinely assess the impact of development activities on water sources; protect strategic water reserve; and prepare emergency plan for natural or man-made disasters.
3. *Conserving and protecting the eco-system* – recommendation: establish a rate for depletion of non-renewable groundwater sources for the irrigation sector; proper treatment of all domestic and industrial waste water and recycling for

irrigation; prohibition of disposal of hazardous waste in surface and groundwater source; rehabilitation of natural and man-made polluted surface and ground water sources; urban planning and water pollution control; conservation, monitoring and protecting natural vegetal cover; updating and enforcing water legislation; and control of imported products which contribute to pollution

4. *Securing adequate food supply* – recommendations: clarify priorities on water allocation (domestic use followed by irrigation and industrial uses); agriculture policy should aim at more crop per drop; better selection of crops in terms of economic return, water consumption; increase use of biotechnology; improve irrigation and application of water saving technology; determine water allocation among sectors according to needs, economic return and trade-offs between groundwater and treated waste and drainage waters; clarify policy on food security and WATO agreement; and adjust the use of government subsidies and incentives to encourage water conservation.
5. *Institutional arrangement* – recommendations: strengthen decentralisation of water institutions to the lowest level with regard to the development and management of water sources; precisely establish the jurisdiction of each water institution and enhance horizontal integration, cooperation and enforcement through administrative and legal measures; provide on the job training for staff and develop educational opportunities; strengthen training centres; provide employment incentives and promotions; sponsor research and development programmes by governments and the private sector; and strengthen of links between concerned ministries and academic institutions.
6. *Enhancing the role of the civil society* – recommendations: encourage stakeholder participation and consultation with water user associations, non-governmental organisations and private sector representatives in the formulation and enforcement of water policies; enhance the role of local government in the development and management of water resources; protect the rights of societies; and conduct public awareness campaigns.
7. *Regional co-operation* – recommendations: develop and manage shared water sources through joint committees; encourage bilateral and multilateral agreements and protocols on the exchange of data; monitor and protect against the pollution of shared water resources; and exchange experiences on different water management approaches.
8. *Valuing Water*: increased awareness on water cost; setting water tariffs for all consuming sectors including irrigation; gradual implementation of cost recovery; tariffs should accommodate low income population; pollution fines should be imposed on manufacturing, agriculture and oil industries; broader role for finance through donors and private sector.

WATER SUPPLY MANAGEMENT

Executive Summary of ESCWA Briefing Paper No. 13

The briefing paper gives an overview of conventional and non-conventional water availability in the ESCWA Member States, and highlights the declining per capita share of water in the region, which is just above the international poverty threshold. The paper also briefly reviews the sectoral allocation of water in the region and assesses the extent of dependency on groundwater for different member countries. The quantity and costs of production of non-conventional waters resources and their contribution to the total water supply in the region are also reviewed.

The non-conventional water resources in the ESCWA region are derived from:

- Desalination, where ESCWA region has become a world leader in sea and brackish water desalination. In the year 2000, more than 70 per cent of the domestic water requirements in the countries of the Gulf Cooperation Council relied on desalination;
- Irrigation return flow; and
- Treated wastewater, including treated industrial wastewater (with limitations).

The constraints facing the management of water supplies in the ESCWA region were highlighted along with the different approaches taken by ESCWA Member States in overcoming these constraints and confronting the water deficit. These constraints can be summarized as:

- Natural scarcity of freshwater resources;
- Social pressures leading to fast growing demand and increased pollution;
- Management shortcomings, specifically the implementation of tools of integrated water resources management (IWRM) to overcome coordination, decentralization, legislation, enforcement and capacity building issues;
- Technical constraints, such as data, monitoring, technology development the cost and energy intensity of desalination processes;
- Economic and financial pressures regarding tariffs, cost recovery, operation and maintenance of water infrastructures and investment requirements; and
- Political issues relating to management of shared waters.

The elements of a future vision for better management of water supply have been grouped into several categories. These address the need for:

- Better systems for monitoring supplies and collecting, analysing and disseminating relevant water resources data;
- Building a comprehensive and reliable database for data exchange system, and using mathematical models for various applications when deemed important;

- Developing GIS systems for surface and groundwater resources to better monitor water availability, discharge, control structures, wells, along with all the relevant information;
- Increasing and developing non-conventional water supplies by using latest innovative technologies;
- Increasing the conventional water resources by controlling the losses from large surface water bodies, by using modern irrigation methods such as sprinkler irrigation system, by minimizing leakage in pipe networks and by protecting water resources from pollution;
- Formulating effective water policies and strategies;
- Increasing the availability of adequate financial resources;
- Encouraging stakeholder participation;
- Achieving better water allocation among water consuming sectors;
- Updating and enforcing water legislation;
- Enhancing capacity building; and
- Achieving regional cooperation on shared water resources.

In view of these challenges and recommendations, several ESCWA Member States have taken proactive measures to improve water supply management. The paper reviews some of the actions taken in Egypt, Lebanon, Oman and the United Arab Emirates, towards better water supply management.

WATER DEMAND MANAGEMENT

Executive Summary of ESCWA Briefing Paper No. 14

As opposed to supply management, where the primary strategy to meet the demand is by increasing the supply, the primary objectives of demand management is to rationalise and control water use, reduce waste and increase use efficiency and equity in view of limited supplies. This paper addresses water demand management as an alternative approach for confronting growing water demand in the ESCWA region. A review of challenges and recommendations for consideration are also offered.

The paper groups the tools for water demand management within the contest of three broad categories, namely economic instruments, legislative and institutional instruments, and awareness raising and capacity building.

Economic tools embody concepts such as cost recovery, increasing the financial capacity of water utilities to operate and maintain their facilities, promoting well-regulated water markets, and promoting a wider role for the private sector to invest in the water sector.

The legislative and institutional tools consist of the rules and organizational arrangements for managing water use and demand, including water rights, priority of use, role and authority of the water regulator, water pricing, the protection of water quantity and quality, licensing, conflict resolution procedures. These tools should be complemented by mechanisms to encourage coordination between various water agencies and enforcement bodies. They should also promote decentralisation and participation of stakeholders so as to broaden role of the civil society in water management as water demand management strategies develop.

The third tool of demand management involves awareness raising and capacity building. These instruments seek to manage water demand by increasing the awareness of end users and raising their capacity to rationalise water demand and use. Awareness campaigns, extension services and specialised workshop are some of the tools employed for this purpose.

The paper then proceeds to identify the water challenges in the region. These can be categorised as: (1) natural challenges (water scarcity); (2) social challenges (population growth, demand growth and poverty); (3) economic challenges (water tariff reform, privatisation, small capital market, subsidies, etc.); (4) environmental challenges (water quality deterioration); (5) legislative and management challenges (need to update the legislation to incorporate demand management tools such as cost recovery, privatisation, water markets; and coordination of conflict of interest and overlapping mandates, etc.); (6) political challenges (political will and shared water resources issues); (7) technical challenges (waste in supply networks, information shortages, etc.); and (7) financial and human resources constraints and challenges.

The paper also outlines some demand management measures implemented by selected ESCWA Member States. For instance:

- Bahrain has implemented public awareness programmes, updated groundwater legislation to reduce consumption and introduced groundwater tariffs.
- Egypt has endorsed privatisation; several initiatives adopted by the Ministry of Water Resources and Irrigation to make necessary institutional and legal reforms in the Ministry's mandate have also advanced. Furthermore, a package of demand-oriented measures was formulated and is being applied in the agricultural sector.
- Jordan prepared a water demand management strategy in 1997; streamlined many water departments and agencies; updated water legislation, revised water tariffs, pursued partial privatisation of water supply with municipalities through management contract; and is implementing public awareness programmes.
- Lebanon streamlined the number of agencies responsible for water from 21 to 4. The country also adopted privatisation schemes and a new tariff system.
- Water resources management in the West Bank and Gaza Strip is largely dependent on the political situation, but the water policy is oriented to demand management. Water tariffs cover the real cost of water and the polluter pays principle is being implemented.
- Saudi Arabia established a Water Ministry and is reviewing the water tariffs; measures were taken to reduce agricultural water use.
- Yemen has formulated a water policy and strategy; new water legislation; and established National Water Resources Authority to manage water resources and adopted measures to reform water tariffs.

A number of recommendations are also proposed to improve water demand management. These include:

- Adopting clearly defined long-term water resources development and management policies within the context of five-year development plans;
- Updating of water legislation along with effective enforcement mechanism;
- Encouraging private sector participation in financing and managing water utilities;
- Improving awareness regarding the need to increase water use efficiency;
- Developing institutional and legal tools for effective and equitable allocation of water resources;
- Strengthening capacity and sharing appropriate knowledge and technologies;
- Increasing the financial allocation for research and development on water demand management;
- Encouraging the active participation of stakeholders, water user boards, women, and NGOs in the planning and management and conservation of water; and
- Assessing water resources periodically using advanced methods.

ROLE OF ESCWA IN REGIONAL PREPARATIONS FOR THE WORLD SUMMIT ON SUSTAINABLE DEVELOPMENT

Executive Summary of ESCWA Briefing Paper No. 15

At its Millennium Session in 2001, the United Nations General Assembly adopted resolution 55/199 to carry out a ten-year review of the progress achieved in the implementation of the 1992 UNCED. This review will take place at the World Summit on Sustainable Development (WSSD) in Johannesburg, South Africa from 26 August to 4 September 2002. As one of the regional commissions, ESCWA was assigned by the General Assembly to coordinate regional preparations for the 2002 Summit, in cooperation with the Regional Offices of the United Nations Environment Programme (UNEP) and the United Nations Development Programme (UNDP). In the advent of the Johannesburg Summit, a Joint Secretariat was established to coordinate activities that aim at consolidating and reasserting sustainable development principles and goals for the region. The Joint Secretariat was comprised of ESCWA, the Technical Secretariat of the Council of Arab Ministers Responsible for the Environment (CAMRE), and the UNEP Regional Office for West Asia (UNEP/ROWA). Regional preparations were held in collaboration with the League of Arab States and other regional organisations, including the Joint Committee on Environment and Development in the Arab Region (JCEDAR).

The briefing paper on the role of ESCWA in regional preparations for WSSD presents summaries of the regional preparatory processes. This included a thematic roundtable for eminent persons; four regional forums for non-governmental organisations, industry representatives, parliamentarians and regional stakeholders; the Preparatory Committee Meeting for West Asia and the Arab Region; and the joint meeting held with the African Ministerial Council. A description of the outcomes of these regional preparatory meetings is presented in the brief, including the regional assessment report identifying the achievements and requirements of sustainable development in the Arab region, the Arab Ministerial Declaration on Sustainable Development for WSSD, and the Joint Arab-African Ministerial Declaration.

The brief also presents summaries of a number of publications, which were prepared by ESCWA in the advent of the WSSD, namely: a study on sustainable development planning in the region, a regional assessment report on the achievements and constraints to sustainable development, a study on governance and the institutional framework for achieving sustainable development in the region, and a series of briefing papers on primary issues regarding sustainable development.

These accomplishments come about as continuation to ESCWA efforts to familiarize its member countries with the primary issues that affect the pattern of sustainable development in the region, and to enhance their negotiation capacity at a Summit that promises an opportunity to reinvigorate the quest to build a more sustainable future.

THE EFFECTS OF PEACE AND SECURITY ON SUSTAINABLE DEVELOPMENT IN THE ESCWA REGION

Executive Summary of ESCWA Briefing Paper No. 16

The decade since the 1992 Earth Summit has brought peace to parts of the ESCWA region and with it the opportunity for sustainable development. The early 1990s witnessed the end of the Gulf War, the unification of North and South Yemen, the end of the Lebanese civil war; as well as the end of the first *intifada* and the beginning of the Middle East Peace Process. The 1990s for countries emerging from years of armed conflict have been geared towards overcoming the legacies of war and making up for lost decades of development. Progress was thus possible following periods of conflict.

However, the prevailing instability has seriously affected peace and security in the region, particularly the inability to resolve the occupation of Palestinian and Arab territories on a just and equitable basis. This factor was the major constraint to sustainable development of the ESCWA region. Furthermore, the continued internationally imposed sanctions and hostilities against Iraq have contributed to socio-economic stagnation in that country and in surrounding neighbouring countries. Continuing violence and closure policies in the West Bank and Gaza have negated sustainable development efforts that were initiated following the Oslo Accords. The September 11th attacks on the United States amplified the effects of the global economic downturn and negatively impacted regional exports, while tourism and investment remain tempered by perceived instability, terrorism and political risk.

Regional conflicts have also created large groups of refugees and displaced persons. Palestinian refugees number almost 4 million. The Gulf War caused the expulsion of millions of Palestinian, Yemeni and other migrant workers from Gulf countries, exacerbating poverty and unemployment at home. Strategies for equitable and sustainable development must incorporate efforts to address the needs of these marginalized groups.

Although there have been noticeable improvements in water policies in the region, the lack of sustained peace and security has also hindered sustainable management of shared water resources. This was exacerbated even further by the fact that over 80 per cent of the region's renewable water resources originate from outside of ESCWA Member States. Regional conflicts have also inflicted serious damage to marine and coastal environments, particularly in form of massive oil spills and destruction of ecosystem habitats.

The brief on the effects of peace and security on sustainable development identifies the trends and challenges that have constrained efforts to achieve sustainable development over the past decade. A platform of priorities for action is formulated to suggest means for moving towards sustainable development, within the context of achieving peace and security in the ESCWA region.

THE EFFECTS OF SOCIO-ECONOMIC INEQUITY ON SUSTAINABLE DEVELOPMENT IN THE ESCWA REGION

Executive Summary of ESCWA Briefing Paper No. 17

Over the past decade, the ESCWA region has witnessed marked improvements in health, fertility rates, education and literacy, as well as a strengthening in the status of women and an expanded role for civil society. This progress has been achieved in face of increasing population pressures, fluctuating economic conditions, prevailing unemployment, continued poverty and unresolved regional conflicts.

Economic growth and public spending – propelled primarily by oil revenues – have allowed ESCWA Member States to better respond to the region's socio-economic needs over the past decade. However, growth has come at a price. Public expenditures have become increasingly unsustainable, as debt repayments encroach on social spending and environmental improvements. Changing consumption patterns have also led to increased stress on the environment. In response, civil society is growing more alert and has served to better respond to local needs. However, participatory and more effective governance structures are still needed.

While important gains have been achieved, disparities in social progress and income equality remain pronounced throughout the region. Differences between ESCWA member States are paralleled by disparities within each country, especially along rural-urban lines and with regards to marginalized groups. Accordingly, while the majority of people in Western Asia have better access to basic public services, important gaps in health, education and welfare persist.

As the ESCWA region faces the future, challenges with respect to population, education, illiteracy, social integration and governance persist. Although the region has made tremendous efforts towards economic restructuring, social and political reforms have, for the most part, lagged behind. Participatory governance is key to achieving sustainable development goals; in this respect, governments, civil society and the private sector, each have important roles to play in raising better-educated children, healthier and smaller families, and expanding opportunities for the economic and social integration for vulnerable groups, particularly the poor, women, children and the elderly.

The brief on socio-economic inequities in the ESCWA region reviews the issues, trends and challenges that characterize the impact that socio-economic inequality has had on efforts to pursue sustainable development over the past decade. A platform of priorities for action is provided to highlight key concerns regarding socio-economic inequity, namely: managing population growth, improving education, reducing illiteracy, strengthening governance and supporting social integration. Recommendations are then offered to assist countries to find ways to move closer towards sustainable development during the coming ten to twenty years.

THE EFFECTS OF POVERTY AND UNEMPLOYMENT ON SUSTAINABLE DEVELOPMENT IN THE ESCWA REGION

Executive Summary of ESCWA Briefing Paper No. 18

From 1960 to 1985, the ESCWA region was able to capitalize on its natural resource base and high oil prices to achieve annual growth rates of five per cent, thus making great advances in socio-economic development. On a regional basis, the ESCWA region experienced the second largest absolute increase in its Human Development Index (HDI) value between 1960 and 1992. However, over the past decade, while other regions of the world transformed their economies from public sector dominated, natural resource-based economies into more diversified and export-oriented knowledge-based economies, the ESCWA region embarked only recently on economic reforms to that effect. As a result of late effort into restructuring and of reduced oil revenues, from 1990 to 1999, ESCWA member States experienced low annual per capita GDP growth, performing only better than Sub-Saharan Africa. HDI improved only marginally as falling per capita income, economic stagnation, and population growth combined to increase poverty and unemployment during the 1990s.

Poverty and unemployment are among the primary challenges to sustainable development in ESCWA Member States. The structural causes of unemployment in the region are found in the pattern of economic growth, which is largely based on natural resource exploitation, and in the characteristics of the labor force, which is increasingly young and inadequately trained to meet labor market needs. Poor performance in labor markets is also largely due to: continued high dependency on the public sector for employment creation, regional conflicts, labor migration and the challenges of incorporating the informal sector into the formal economy. The informal sector has been absorbing much unskilled labor, but its corresponding low wages have not raised incomes. As a result, low real wages and limited employment opportunities have combined to expand and deepen poverty in the region.

Furthermore, natural resource-based growth has largely tied regional development to oil price fluctuations and has stymied efforts at economic diversification. As such, although globalization has formally dismantled barriers to trade and capital mobility and brought about advances in information and communication technologies, the corresponding opportunities that these advances may bring have not been fully exploited in the ESCWA region. Limited commitment to economic diversification has thus resulted in limited new employment opportunities, particularly for recent graduates.

This brief on the effects of poverty and unemployment on sustainable development in the ESCWA region identifies the impacts that poverty and unemployment have brought to bear on efforts to achieve sustainable development over the past decade. A platform of priorities for action identifies the key unemployment and poverty challenges that must be addressed to strengthen progress towards sustainable development in the region during the coming ten to twenty years.