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**ECONOMIC AND SOCIAL COMMISSION  
FOR WESTERN ASIA**

Energy and Natural  
Resources Division

Regional Centre for the NRSE  
Information Network

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FOR WESTERN ASIA

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**DIRECTORY  
OF  
NEW AND RENEWABLE ENERGY RESOURCES**

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**FOREWORD**

The present Directory has been issued by the Economic and Social Commission for Western Asia (ESCWA) Energy and Natural Resources Division as an additional activity to its regular programme of work for the biennium 1990-1991. This first draft is based on incomplete information provided by the member countries; once compiled, it will be circulated to member countries of the network for review, so that a revised version of the Directory can be issued to provide more accurate data and to cover the most recent activities on new and renewable sources of energy in the region.

## INTRODUCTION

The main goal of establishing the New and Renewable Sources of Energy (NRSE) Information Network is to secure and maintain the flow of information related to new and renewable energy sources to and from the ESCWA countries. This is achieved by:

(a) Establishing a database covering the various activities specific to the new and renewable energy fields;

(b) Exchanging information between the participant organizations for the purpose of distributing and using this information in the most effective manner;

(c) Increasing and developing the abilities of the national centres involved in the development of NRSE by organizing programmes, meetings, conferences, etc.;

(d) Exchanging information with regional and international networks for new and renewable energy concerning the projects, the conferences and the publications in this field.

In the third technical meeting for participant organizations in the network, held in Amman in November 1987, it was agreed that the Solar Energy Research Centre in Iraq would be the host centre for this network. In December 1988, a Memorandum of Understanding was signed between the Iraqi Government and ESCWA for the purpose of establishing the regional centre for the NRSE information network.

At the present time, the network includes Iraq, Jordan and Egypt, and several other ESCWA countries are expected to join. The other Arab countries outside the ESCWA region are also welcome to join the network.

This draft Directory presents information available on the projects, organizations and specialists working in fields related to new and renewable energy sources. This information was taken from questionnaires distributed among the different organizations working in this field in Iraq, Jordan and Egypt. Some information concerning hydropower generation in the Syrian Arab Republic and Lebanon was taken from ESCWA documentation.

The Directory has been jointly prepared by the ESCWA secretariat and the host centre for the network. It is being distributed to the members of the network for their comments and for completion of information included therein.

I. DATA COLLECTION AND ANALYSIS PROJECTS

Project: Expansion of the solar radiation measuring network in Iraq

Country: Iraq

Organization: Solar Energy Research Centre

Status: Operating

Objectives: The project aims to: (a) evaluate the country potential for the development and utilization of new and renewable sources of energy with a view to achieving energy conservation through a reduction in the consumption of fossil fuels; (b) develop systems utilizing solar and wind energy that are suitable for Iraq; and (c) establish and develop scientific bases and know-how in solar and wind technologies.

II. SOLAR THERMAL CONVERSION APPLICATIONS PROJECTS

A. Water heating

1. Project: Evaluation and development of solar water heaters  
Country: Iraq  
Organization: Solar Energy Research Centre  
Status: Operating  
Objectives: The project aims for the more widespread use of solar hot water heaters. Once domestic-sector use is established, other applications can be considered. Implementation of the project objective can be facilitated by supporting local industries in the research and development of suitable designs for collectors and other components through the use of locally available materials and the local labour force. It is envisaged that this project will ensure the acceptable quality and performance of locally manufactured solar hot water systems.
  
2. Project: Manufacture of solar water heaters for industrial applications  
Country: Jordan  
Organization: Royal Scientific Society (RSS) Solar Energy Centre  
Status: Operating  
Objectives: Studying the possibility of utilizing solar collectors to provide the bulk of energy needed to heat water for industrial uses and for large public buildings.
  
3. Project: Development of flat-plate collectors for domestic and large solar water heaters  
Country: Jordan  
Organization: Royal Scientific Society, Solar Energy Centre  
Status: Completed  
Objectives: Setting national standards for various types of flat-plate collectors and developing optimum hot-water supply systems for households and large consumers.

B. Heating and cooling

1. Project: Heating with solar energy  
Country: Iraq  
Organization: Solar Energy Research Centre  
Status: Operating  
Objectives: Demonstrating the possibility and feasibility of using solar energy for heating buildings using flat-plate solar collectors or solar-assisted heat pumps.
  
2. Project: Construction of Iraqi solar house  
Country: Iraq  
Organization: Solar Energy Research Centre  
Status: Completed  
Objectives: The structure is used as a rest-house for the centre guests and as a practical laboratory for the study of solar air conditioning. It has a total air-conditioned area of 400 m<sup>2</sup>, and is fully cooled and heated by solar energy.
  
3. Project: Solar Energy Research Centre building  
Country: Iraq  
Organization: Solar Energy Research Centre  
Status: Completed  
Objectives: One of the largest buildings to be cooled by solar energy, it has a total air-conditioned area of 5,358 m<sup>2</sup> and comprises laboratories covering all solar and wind research fields.
  
4. Project: Iraqi-Jordanian project  
Country: Iraq  
Organization: Solar Energy Research Centre  
Status: Operating



Objectives: The project is currently being jointly executed between the solar energy research centres of Iraq and Jordan. It consists of two stations near the two countries' shared border. Each station consists of a guest house and rooms for collecting data on the system's performance. The energy needed to heat, cool and light the stations is supplied by solar energy. A mechanical windmill for water pumping is also installed on the premises of each project.

5. Project: Solar kindergarten building
- Country: Iraq
- Organization: Solar Energy Research Centre and L'Agence Francaise pour la Maitrise de l'Energie (AFME).
- Status: Completed
- Objectives: To gain practical experience in determining the suitability of implementing various passive measures in the region for the purposes of heating and cooling and to gain experience in the operation of photovoltaic systems, components and equipment.

C. Power generation

1. Project: Thermal energy storage study
- Country: Iraq
- Organization: Solar Energy Research Centre
- Status: Operating
- Objectives: To carry out a study on: (a) the storage of thermal energy by reversible thermochemical reactions; (b) the storage of thermal energy by sensible heat, including the use of solid materials such as rock, metal and organic liquid; (c) the storage of heat from sources such as latent heat, inorganic salts, eutectic mixtures, and organic materials; and (d) developing suitable technology for the above category.
2. Project: Thermal conversion of solar energy plant
- Country: Iraq
- Organization: Solar Energy Research Centre
- Status: Planned

Objectives: The construction of a small, central receiver-system plant for the conversion of solar energy to electricity. The plant is to comprise a number of heliostats that track the motion of the sun to direct the incident rays to a central receiver to produce the high temperatures necessary for the production of thermal cycles for electricity generation. There are plans to construct this plant at the Solar Energy Research Centre in Baghdad to gain familiarity and experience with such systems.

3. Project: Power plant for the production of electric power and fresh water using low-temperature sources

Country: Egypt

Organization: Cairo University

Status: Operating

Objectives: The development of isolated areas and the desert for the use of the above system.

#### D. Agricultural applications

Project: Evaluation of agricultural-energy technologies in Egypt

Country: Egypt

Organization: Cairo University, Faculty of Engineering

Status: Operating

Objectives: The research aims at: (a) developing measures for comparing the effectiveness of various technologies in providing farm-level energy requirements for the production of increased agricultural yields in Egypt; (b) employing such measures to evaluate the impact of modern energy-intensive and traditional energy-extensive technologies on rural poverty; (c) also employing these measures in assessing the risk- and poverty-buffering effects of each technology; and (d) identifying the potential for the matching of rural energy supplies to requirements in Egypt.

#### E. Greenhouses

1. Project: Greenhouse project

Country: Iraq

Organization: Solar Energy Research Centre

Status: Completed

Objectives: The project comprises 42 greenhouses used for research in heating, cooling, soil sterilization, soil reclamation, the use of plastic greenhouses and other aspects of agriculture related to the use of solar energy. The project has been implemented in cooperation with the Royal Scientific Society (RSS) of Jordan.

2. Project: Study on the effect of solar energy on soil properties

Country: Iraq

Organization: Solar Energy Research Centre

Status: Operating

Objectives: The objectives of this project are to: (a) study the effect of solar energy (as a light and thermal source) on the soil; (b) evaluate quantitative changes in the soil's chemical, physical and microbiological properties; (c) to determine the availability of micro/macro-nutrients for plant growth in soil heated by solar energy; (d) select soil with the greatest bulk, density and moisture content for maximum soil solarization; (e) study the relationship between the greenhouse environment and weather components; (f) study the effect of soil colour on greenhouse conditions; (g) study the use of solar energy--as a clean source of energy--for soil sterilization; and (h) select a suitable plastic-film colour (as greenhouse cover) for maximum soil solarization.

3. Project: Different types of irrigation systems

Country: Iraq

Organization: Solar Energy Research Centre and the Ministry of Irrigation

Status: Completed

Objectives: The objective of this study is to determine the performance and economic feasibility of different drip-irrigation systems; water use efficiency, emitters clogging, physical and ageing properties together with crop yield and quality. It is also concerned with the comparison of this type of irrigation with furrow irrigation.

4. Project: Improvement of the photo-stability of the low-density polyethylene (LDPE) film greenhouse

Country: Iraq

Organization: Solar Energy Research Centre

Status: Completed

Objectives: The aim of this project is to study the effect of different types of stabilizers on the photo-degradation of the low density polyethylene (LDPE) used in greenhouse covers under the diverse climatic conditions in different parts of Iraq (measuring light and temperature). The study will also try to determine the feasibility of using infrared retention materials as additives for improving the thermal properties of LDPE used for greenhouses and ultimately the effect of this cover on plant growth. This project will also study the effect of backing materials on the photo-stability of LDPE-containing light stabilizers under hot climatic conditions (i.e., the summer months in Baghdad).

#### F. Desalination

Project: Water desalination

Country: Iraq

Organization: Solar Energy Research Centre

Status: Operating

Objectives: To study the performance of different water desalination schemes using solar and conventional energy; these include various types of simple stills such as the basin and wick types, in addition to the more complicated systems employing reverse osmosis, etc.

### III. PHOTOVOLTAIC APPLICATIONS PROJECTS

1. Project: Utilization of solar and wind energy for the development of the Sinai Peninsula  
  
Country: Egypt  
  
Organization: National Research Centre  
  
Status: Completed  
  
Objectives: The project aims at designing, erecting, and evaluating a hybrid energy system dependent upon solar and wind energy sources. The system includes a solar photovoltaic (P.V.) power module connected to an alternating current (AC), together with a wind turbine, for water pumping and lighting. The goal is to develop an energy system suitable for improving the social and economic conditions of the small nomadic communities living in Sinai.
  
2. Project: Photovoltaic-power station  
  
Country: Iraq  
  
Organization: Solar Energy Research Centre  
  
Status: Completed  
  
Objectives: To install a ten kilowatt-hour photovoltaic-power unit in a village in the marshlands of southern Iraq to meet the basic needs of the village inhabitants. The system comprises: (a) a number of different types of photovoltaic panels; (b) storage batteries to provide electricity for five cloudy days; and (c) a regulator and measuring instruments, including a 30-channel data-acquisition system with a current voltage (I.V.) characteristics plotter; it also measures and records such data as wind speed, direct solar insolation, temperature and dust density. The measuring equipment is housed in one room of a two-room prefabricated house with the other room housing the batteries.
  
3. Project: Design and testing photovoltaic water-pumping systems  
  
Country: Jordan  
  
Organization: Royal Scientific Society, Solar Energy Centre  
  
Status: Completed

Objectives: The project aims at: (a) evaluating the technical and economical feasibility of using water-pumping systems powered by P.V.; (b) comparing photovoltaic water-pumping systems with pumping systems powered by diesel motors; (c) training staff to design and install photovoltaic-energy systems and to provide consultancy services in the photovoltaic-energy field; and (d) evaluating the feasibility of providing electricity to small remote villages using photovoltaic generators.

4. Project: Solar pump for vertical drainage

Country: Iraq

Organization: Solar Energy Research Centre and the Ministry of Irrigation

Status: Operating

Objectives: The study is concerned with the use of solar energy to produce enough electricity to drive a pump used for vertical drainage; the pump is used to reduce the level of underground water to help solve the soil salinity problem.

5. Project: Electricity generation for irrigation pumps using photovoltaic panels

Country: Iraq

Organization: Solar Energy Research Centre and the Ministry of Irrigation

Status: Operating

Objectives: The study aims to evaluate the technical and economic feasibility of using water-pumping systems powered by P.V. It also includes an economic feasibility study for evaluating the use of this system in remote areas.

6. Project: Car-park lighting system using solar power

Country: Iraq

Organization: Solar Energy Research Centre

Status: Completed

Objectives: To investigate the effects of weather conditions on the performance of a car-park lighting system powered by P.V. Each system, composed of 15 lights, comprises a solar generator, a charge regulator, a storage battery, an AC/DC inverter, an electronic timer and an 11-watt light tube.

IV. SOLAR CHEMICAL CONVERSION APPLICATIONS PROJECTS

Project: None

V. PASSIVE-DESIGN PROJECTS

1. Project: Conservation of electrical-energy in Egyptian residential buildings

Country: Egypt

Organization: Mansoura University, Faculty of Engineering

Status: Completed

Objectives: Experimental testing was carried out to assess three separate approaches to reducing national energy consumption. These include: (a) determining energy efficiency in building construction techniques, with attention to such factors as renewable energy sources, space utilization, the effectiveness of building insulation materials, types of glass for windows, etc.; (b) developing energy labelling for domestic appliances which would show electricity consumption rates to consumers; and (c) promoting public awareness of the value of energy and the merits of conservation.
  
2. Project: Upgrading of window quality and performance in Jordan

Country: Jordan

Organization: Royal Scientific Society, Solar Energy Centre

Status: Completed

Objectives: To improve the design, manufacture and installation of windows to minimize energy losses, and subsequently set standards to this effect.



VI. BIOMASS CONVERSION PROJECTS

1. Project: Analysis of the impact of biogas technology on Egyptian agriculture

Country: Egypt

Organization: Soil and Water Research Institute

Status: Completed

Objectives: This study aims at providing a systematic description of agricultural techniques system with biogas technology and without it. The first objective of the study will be the development of a detailed profile of energy-use patterns on farms in rural Egypt. The second objective, to be done concurrently, will be to assemble data on the characteristics of several different types of biogas technology and different sizes of plants, to combine this data with information on farm crop production and utilization, and to calculate the additional quantities of fertilizers, and potential crop yields that would result from the introduction of biogas technology. The third and final objective will be an economic-feasibility evaluation or cost-benefit analysis of the physical and technical data generated in the first two objectives.
  
2. Project: Utilization of local materials to construct biogas units for production of energy and organic manure

Country: Egypt

Organization: Soil and Water Research Institute

Status: Completed

Objectives: The project objective is to utilize animal and human wastes to construct a biogas system for producing energy and organic manure. Biogas technology provides a clean and convenient fuel for cooking, space heating and lighting for chicken farms, and for powering internal-combustion engines. The organic manure obtained after using the biogas system is more plentiful, richer in nitrogen content and freer from pathogens and parasites when compared with traditionally prepared manure.
  
3. Project: Development of biogas digester for rural areas of Egypt

Country: Egypt

Organization: Soil and Water Research Institute

Status: Completed

Objectives: Evaluation of organic-acid productivity and soluble organic compounds during the acid fermentation of major crop residues available in rural Egypt. The project includes the design and manufacture of an appropriate biogas digester comprising a two-stage fermentation system. The evaluation of the economic feasibility of the newly designed digesters also takes into consideration the amount of manure left over and the utilization efficiency.

4. Project: Biogas for the rural population in Egypt

Country: Egypt

Organization: Soil and Water Research Institute, through the Ministry of Agriculture

Status: Study completed

Objectives: The aim of the project is to help the Egyptian governorates, to introduce biogas technology (production and use) into rural Egypt. This will be accomplished by building biogas demonstration models in different areas of the country (about 7 villages), and will be accompanied by extension advisory services through the news media, symposiums, training programmes, etc., and by identification of the problems associated with biogas under local conditions.

5. Project: Biogas technology for rural Egypt

Country: Egypt

Organization: Soil and Water Research Institute

Status: Operating

Objectives: The project objectives are: (a) identifying organic resources available in the villages and their potential for biogas; (b) building household biogas units, evaluating their acceptability by the farmers, evaluating the economic returns from biogas technology in comparison with those of traditional crop residues and animal droppings; (c) training farmers on the construction, operation and maintenance of the biogas digesters, as well as on the use of the most appropriate organic gas manure; and (d) research on the monitoring and identification of problems associated with biogas production.

VII. WIND-ENERGY APPLICATIONS PROJECTS

1. Project: An efficient combined solar-wind energy system  
Country: Egypt  
Organization: National Research Centre  
Status: Operating  
Objectives: To develop a combined solar-wind energy system for use in remote areas (Stand-alone) using all available resources--starting with elementary electronic and mechanical hardware; and (b) to determine the cost of the system.
  
2. Project: Wind-energy utilization for water-pumping from deep wells  
Country: Jordan  
Organization: Royal Scientific Society, Solar Energy Centre  
Status: Study completed  
Objectives: The aim of this project is to strengthen RSS capabilities in wind-energy technology so that it can become the body responsible for the transfer and development of such technology to help Jordan utilize its resources to meet the energy demand for water pumping. Part of the development of such technology will involve joint research between the RSS and German firms working in this field. In addition, RSS will build its own mechanical wind-pumping system and electrical wind converter, utilizing the technology and materials available in the Jordanian market.
  
3. Project: Utilization of solar and wind energy to supply basic energy needs in remote areas  
Country: Jordan  
Organization: Royal Scientific Society, in collaboration with the Ministry of Energy and Mineral Resources  
Status: Operating  
Objectives: To enhance the social and economic development in remote and rural areas of Jordan by meeting basic energy needs through the use of locally manufactured energy equipment.

4. Project: Electricity generation using wind energy in Ras Muneef
- Country: Jordan
- Organization: Ministry of Energy and Mineral Resources
- Status: Completed
- Objectives: The project aims to: (a) select and then evaluate the performance of commercially available windmills under local climatic conditions; (b) prepare a wind atlas for Jordan to identify the most promising sites for the use of wind energy for electricity generation; (c) determine the practicality of generating electricity through the use of wind technology, as well as its cost-effectiveness and technical feasibility; (d) investigate the possibility of manufacturing windmills in Jordan; and (e) train local technicians on windmill technology.



IX. HYDROPOWER-GENERATION APPLICATIONS PROJECTS

1. Project: Aswan station  
Country: Egypt  
Organization: Ministry of Electricity, Egypt Electricity Authority  
Status: Completed  
Objectives: To produce electricity; the total station capacity is 345 MWh.
  
2. Project: Aswan II station  
Country: Egypt  
Organization: Ministry of Electricity, Egypt Electricity Authority  
Status: Completed  
Objectives: To produce electricity; the total station capacity is 300 MWh.
  
3. Project: High Dam station  
Country: Egypt  
Organization: Ministry of Electricity, Egypt Electricity Authority  
Status: Completed  
Objectives: To produce electricity; the total station capacity is 2,100 MWh.
  
4. Project: Derbendikahn Dam station  
Country: Iraq  
Organization: Ministry of Industry, State Organization for Electricity  
Status: Completed  
Objectives: To produce electricity; the total station capacity is 240 MWh.
  
5. Project: Dokan Dam station  
Country: Iraq

- Organization: Ministry of Industry, State Organization for Electricity  
Status: Completed  
Objectives: To produce electricity; the total station capacity is 400 MWh.
6. Project: Hamreen Dam station  
Country: Iraq  
Organization: Ministry of Industry, State Organization for Electricity  
Status: Completed  
Objectives: To produce electricity; the total station capacity is 50 MWh.
7. Project: Al-Thawra station  
Country: Syrian Arab Republic  
Organization: Public Establishment for Electricity  
Status: Completed  
Objectives: To produce electricity; the total station capacity is 800 MWh.
8. Project: Rastan station  
Country: Syrian Arab Republic  
Organization: Public Establishment for Electricity  
Status: Completed  
Objectives: To produce electricity; the total station capacity is 10 MWh.
9. Project: Souk Wadi Barada station  
Country: Syrian Arab Republic  
Organization: Public Establishment for Electricity  
Status: Completed  
Objectives: To produce electricity; the total station capacity is 7 MWh.

10. Project: Al-Sad Al-Tanizimi station  
Country: Syrian Arab Republic  
Organization: Public Establishment for Electricity  
Status: Under construction  
Objectives: To produce electricity; the total station capacity will be 60 MWh.
11. Project: Youssef Basha station  
Country: Syrian Arab Republic  
Organization: Public Establishment for Electricity  
Status: Planned  
Objectives: To produce electricity; the total station capacity will be 400 MWh
12. Project: Halbieh-Zalbich station  
Country: Syrian Arab Republic  
Organization: Public Establishment for Electricity  
Status: Planned  
Objectives: To produce electricity; the total station capacity will be 35 MWh.
13. Project: Al-Safa station  
Country: Lebanon  
Organization: Electricité du Liban  
Status: Completed  
Objectives: To produce electricity; the total station capacity is 246 MWh.
14. Project: Private station  
Country: Lebanon  
Organization: Electricité du Liban  
Status: Completed  
Objectives: To produce electricity; the total station capacity is 34 MWh.



X. TIDAL-ENERGY APPLICATIONS PROJECTS

Project: None

XI. OIL-SHALE AND TAR-SAND APPLICATIONS PROJECTS

Project: Exploration of oil-shale deposits as an alternative source of energy

Country: Jordan

Organization: Natural Resources Authority

Status: Planned

Objectives: Using oil-shale deposits as a possible alternative source of energy.

Annex I

SPECIALIZED ORGANIZATIONS

A. Solar energy

<u>Name of organization</u>	<u>Address</u>
1. Renewable Energy Research Centre	Amman, Jordan
2. National Research Centre	Cairo, Egypt
3. Solar Energy Research Centre	Baghdad, Iraq
4. New and Renewable Energy Authority	Cairo, Egypt
5. Cairo University	Cairo, Egypt
6. Mansoura University	Cairo, Egypt
7. Alexandria University	Alexandria, Egypt
8. Menofeiya University	Cairo, Egypt
9. University of Baghdad	Baghdad, Iraq
10. University of Technology	Baghdad, Iraq
11. University of Mousel	Mousel, Iraq
12. University of Basrah	Basrah, Iraq
13. Jordan University	Amman, Jordan
14. Saddam University for Science and Technology	Bagdad, Iraq
15. The Royal Scientific Society	Amman, Jordan

B. Biomass

1. National Research Centre	Cairo, Egypt
2. Soil and Water Research Institute	Cairo, Egypt

C. Wind energy

1. Renewable Energy Research Centre	Amman, Jordan
2. National Research Centre	Cairo, Egypt
3. Solar Energy Research Centre	Baghdad, Iraq
4. New and Renewable Energy Authority	Cairo, Egypt
5. Cairo University	Cairo, Egypt
6. Mansoura University	Cairo, Egypt
7. Alexandria University	Alexandria, Egypt
8. Menofeiya University	Cairo, Egypt
9. University of Baghdad	Baghdad, Iraq
10. University of Technology	Baghdad, Iraq
11. University of Mousel	Mousel, Iraq
12. University of Basrah	Basrah, Iraq
13. Jordan University	Amman, Jordan
14. Saddam University for Science and Technology	Baghdad, Iraq
15. The Royal Scientific Society	Amman, Jordan

D. Hydropower generation

<u>Name of organization</u>	<u>Address</u>
1. Ministry of Electricity, Egypt Electricity Authority	Cairo, Egypt
2. Ministry of Industry, State Organization for Electricity	Baghdad, Iraq
3. Public Establishment for Electricity	Damascus, Syrian Arab Republic
4. Electricite du Liban	Beirut, Lebanon

E. Oil shale

1. Natural Resources Authority	Amman, Jordan
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Annex 11

LIST OF SPECIALISTS

A. Data collection and analysis

<u>Name</u>	<u>Address</u>	<u>Reference number</u>
Akrawi, Asad A.	Iraqi Meteorological Organization, Iraq	1
Shaloot, Mosalem	National Centre for Astronomy and Geophysics, Egypt	2

B. Solar thermal conversion applications

Abdul Haee, Salem S.	Al-Mustansiria University, Baghdad, Iraq	3
Abu-Allan, Faisal	Royal Scientific Society, Jordan	4
Abu-Saleh, Nazih	Damascus University, Syrian Arab Republic	5
Al-Bander, Farouk F.	Solar Energy Research Centre, Iraq	6
Al-Doory, Muthana K.	Solar Energy Research Centre, Iraq	7
Al-Jobouri, Khaldoon	Al-Mustansiria University, Baghdad, Iraq	8
Al-Joudi, Khalid A.	College of Engineering, Al-Anbar University, Iraq	9
Al-Karaghoul, Ali A.	Solar Energy Research Centre, Iraq	10
Al-Shawi, Ibrahim M.	Solar Energy Research Centre, Iraq	11
Kabariti, Malek A.	Royal Scientific Society, Jordan	12
Khalifa, Abdul Jabar N.	Solar Energy Research Centre, Iraq	13
Nuri, Mohamad I.	Al-Mustansiria University, Baghdad, Iraq	14
Owatha, Mohamad B.	Solar Energy Centre, Beirut, Lebanon	15
Saman, Wasim Y.	Saddam University, Iraq	16

C. Photovoltaic applications

<u>Name</u>	<u>Address</u>	<u>Reference number</u>
Al-Douri, Ala. A	Solar Energy Research Centre, Iraq	17
Ali, Kamil S.	Solar Energy Research Centre, Iraq	18
Al-Sharkawy, Abdullatif	National Research Centre, Egypt	19
Mahmoud, Marwan M.	Royal Scientific Society, Jordan	20
Mehadat, Ahmad	Royal Scientific Society, Jordan	21

D. Solar chemical conversion applications

Abbasi, Mahmoud	Solar Energy Research Centre, Iraq	22
Al-Ani, Ramzi	Al-Mustansiria University, Iraq	23
Aliwi, Salah M.	Al-Mustansiria University, Iraq	24
Numan, Salah Al-Din	University of Baghdad, Iraq	25
Abdul-Ghani, Ahlam	University of Baghdad, Iraq	26

E. Biomass

Alaa El-Din, Nabil M.	Soil and Water Research Institute, Egypt	27
El-Shimi, Samir A.	Soil and Water Research Institute, Egypt	28
Khalil, Esam Edin M.	Cairo University, Faculty of Engineering, Egypt	29
Salih, Fadhil M.	Solar Energy Research Centre, Iraq	30

F. Wind energy

<u>Name</u>	<u>Address</u>	<u>Reference number</u>
Amro, Mohamed	Renewable Energy Centre, Jordan	31
Al-Rouhan, Farid	Damascus University, Syrian Arab Republic	32
Al-Shayah, Adel R.	Damascus University, Syrian Arab Republic	33
El-Jabi, Samih	Damascus University, Syrian Arab Republic	34
Mobarak, Amin	Cairo University, Egypt	35
Osman, Galal	El-Mansoura University, Egypt	36
Ta'ani, Rizeq Y.	Renewable Energy Centre, Jordan	37

G. Geothermal-energy applications

Abu Ajamieh, M.	Natural Resources Authority, Jordan	38
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Annex III

BIOGRAPHICAL INFORMATION ON SPECIALISTS\*

<u>Reference number</u>	<u>Information</u>
1	Name: Akrawi, Asad A. Date and place of birth: Address: Degree: Institution: Thesis title: Professional activities (brief): Research activities (brief):
2	Name: Shaltoot, Mosalem Date and place of birth: Address: Degree: Institution: Thesis title: Professional activities (brief): Research activities (brief):
3	Name: Abdul Hae, Salem S. Date and place of birth: Address: Degree: Institution: Thesis title: Professional activities (brief): Research activities (brief):
4	Name: Abu-Allan, Faisal Date and place of birth: Address: Degree: Institution: Thesis title: Professional activities (brief): Research activities (brief):
5	Name: Abu-Saleh, Nazih Date and place of birth: Address: Degree: Institution: Thesis title: Professional activities (brief): Research activities (brief):

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\* Missing information is expected to be included in the new version of the Directory.



Reference number

Information

- 6                    Name: Al-Bander, Farouk F.  
                     Date and place of birth:  
                     Address:  
                     Degree:  
                     Institution:  
                     Thesis title:  
                     Professional activities (brief):  
                     Research activities (brief):
- 7                    Name: Al-Doory, Muthana K.  
                     Date and place of birth:  
                     Address:  
                     Degree:  
                     Institution:  
                     Thesis title:  
                     Professional activities (brief):  
                     Research activities (brief):
- 8                    Name: Al-Jobouri, Khaldoon  
                     Date and place of birth:  
                     Address:  
                     Degree:  
                     Institution:  
                     Thesis title:  
                     Professional activities (brief):  
                     Research activities (brief):
- 9                    Name: Al-Joudi, Khalid A.  
                     Date and place of birth:  
                     Address:  
                     Degree:  
                     Institution:  
                     Thesis title:  
                     Professional activities (brief):  
                     Research activities (brief):
- 10                   Name: Al-Karaghoul, Ali A.  
                     Date and place of birth:  
                     Address:  
                     Degree:  
                     Institution:  
                     Thesis title:  
                     Professional activities (brief):  
                     Research activities (brief):



<u>Reference number</u>	<u>Information</u>
16	Name: Saman, Wasim Y. Date and place of birth: Address: Degree: Institution: Thesis title: Professional activities (brief): Research activities (brief):
17	Name: Al-Douri, Ala A. Date and place of birth: Address: Degree: Institution: Thesis title: Professional activities (brief): Research activities (brief):
18	Name: Ali, Kamil S. Date and place of birth: Address: Degree: Institution: Thesis title: Professional activities (brief): Research activities (brief):
19	Name: El-Sharkawy, Abdullatif Date and place of birth: Address: Degree: Institution: Thesis title: Professional activities (brief): Research activities (brief):
20	Name: Mohmoud, Marwan M. Date and place of birth: Address: Degree: Institution: Thesis title: Professional activities (brief): Research activities (brief):
21	Name: Mehadat, Ahmad Date and place of birth: Address: Degree: Institution: Thesis title: Professional activities (brief): Research activities (brief):

<u>Reference number</u>	<u>Information</u>
22	Name: Abbasi, Mahmoud Date and place of birth: Address: Degree: Institution: Thesis title: Professional activities (brief): Research activities (brief):
23	Name: Al-Ani, Ramzi Date and place of birth: Address: Degree: Institution: Thesis title: Professional activities (brief): Research activities (brief):
24	Name: Aliwi, Salah M. Date and place of birth: Address: Degree: Institution: Thesis title: Professional activities (brief): Research activities (brief):
25	Name: Numan, Salah Al-Din Date and place of birth: Address: Degree: Institution: Thesis title: Professional activities (brief): Research activities (brief):
26	Name: Abdul-Ghani, Ahlam Date and place of birth: Address: Degree: Institution: Thesis title: Professional activities (brief): Research activities (brief):
27	Name: Alaa El-Din, Nabil M. Date and place of birth: Address: Degree: Institution: Thesis title: Professional activities (brief): Research activities (brief):

<u>Reference number</u>	<u>Information</u>
28	Name: El-Shimi, Samir A. Date and place of birth: Address: Degree: Institution: Thesis title: Professional activities (brief): Research activities (brief):
29	Name: Khalil, Esam Edin M. Date and place of birth: Address: Degree: Institution: Thesis title: Professional activities (brief): Research activities (brief):
30	Name: Salih, Fadhil M. Date and place of birth: Address: Degree: Institution: Thesis title: Professional activities (brief): Research activities (brief):
31	Name: Amro, Mohamed Date and place of birth: Address: Degree: Institution: Thesis title: Professional activities (brief): Research activities (brief):
32	Name: Al-Rouhan, Farid Date and place of birth: Address: Degree: Institution: Thesis title: Professional activities (brief): Research activities (brief):
33	Name: Al-Shayah, Adel R. Date and place of birth: Address: Degree: Institution: Thesis title: Professional activities (brief): Research activities (brief):

Reference number

Information

- 34                    Name: El-Jabi, Samih  
                      Date and place of birth:  
                      Address:  
                      Degree:  
                      Institution:  
                      Thesis title:  
                      Professional activities (brief):  
                      Research activities (brief):
- 35                    Name: Mobarak, Amin  
                      Date and place of birth:  
                      Address:  
                      Degree:  
                      Institution:  
                      Thesis title:  
                      Professional activities (brief):  
                      Research activities (brief):
- 36                    Name: Osman, Galal  
                      Date and place of birth:  
                      Address:  
                      Degree:  
                      Institution:  
                      Thesis title:  
                      Professional activities (brief):  
                      Research activities (brief):
- 37                    Name: Ta'ani Rizeq Y.  
                      Date and place of birth:  
                      Address:  
                      Degree:  
                      Institution:  
                      Thesis title:  
                      Professional activities (brief):  
                      Research activities (brief):
- 38                    Name: Abu Ajamieh, M.  
                      Date and place of birth:  
                      Address:  
                      Degree:  
                      Institution:  
                      Thesis title:  
                      Professional activities (brief):  
                      Research activities (brief):