REGIONAL OFFICE FOR ASIA AND THE SOUTH WEST PACIFIC

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CHAPTER 1. GENERAL INFORMATION

1.1 GEOGRAPHICAL ENVIRONMENT

Geography

The Islamic Republic of Iran lies in the western part of the Iranian plateau about north of eastern hemisphere and the south-west of Asia, and is located approximately between 46°E and 62°E, and 26°N and 38°N. Its neighbours consist of Azerbaijan, Turkmenistan and Armenia in the north, which are around Caspian Sea, Afghanistan and Pakistan in the east and Turkey and Iraq in the west. The sea frontiers of the Persian Gulf and Oman Sea in the south related this country to the height seas and southern neighbouring countries of the Persian Gulf.

It has an area of about 1,648,195 km² and over half of that is mountainous. The main features of the topography can be summarized as a great plateau, between two mountain ranges. In the north, the Alborz Mountains have long east-west ranges of more than 2 km height; these reach more than 5 km height in some places. In the west and southwest, the Zagros Mountains extend over a very long distance. Most of the area is over 1800 m, much of it is over 3000 m and many summits exceed 3600 m. The great plateau, rising 1 km above sea level, occupies most of the country. Some parts, such as the Dasht-e-Lut and Seistan, are only about 500 m above the sea level. South of the Caspian Sea, there are some narrow lands of about 20 m below the sea level.

The principal language is Farsi (Persian), spoken by about 50% of the population. Turkish-speaking Azerbaijanis form about 27% of the population, and Kurds, Arabs, Balochis and Turkomans form less than 25%.

The great majority of Persians and Azerbaijanis are Shi'i Muslims, while the other ethnic groups are mainly Sunni Muslims. There are also small minorities of Christians (mainly Armenians), Jews and Zoroastrians.

The population is 58.1 million as of December 1997.

Climate

The country is mainly arid or semi-arid. Except the northern coastal areas, the climate is extremely continental. In summer hot and dry weather prevails generally and in winter very cold weather is usual, in particular in inland areas.

The climate of the country can be divided into three categories: warm, temperate, rainy with dry summer in a narrow strip in the north; dry, hot desert in the central plateau; dry, hot steppe covering the rest of the country.

Apart from the coastal areas, the temperature in Iran is extremely continental. The annual range of temperature difference is great, from 22°C to 26°C. Winter cold, especially in the north in which the Elburz Mountains exist. The January

mean temperature at Mashhad is 2°C and the minimum is –25°C. On the plateau it is less cold than in the Elburz Mountains. In summer hot weather generally prevails, in particular in the low land area and enclosed valleys such as those of Khuzestan and Luristan where the daily maximum often exceed 44° C.

Summer temperatures of more than 55°C have been recorded. On the plateau the low humidity makes the heat bearable. In the higher places the weather is generally mild and pleasant. At the coasts, where the daily range of temperature is not so great as much inland, the weather is very unpleasant due to the excess of moisture and increased heat.

Since Iran is situated at a considerable height above sea level, the humidity is generally low except for the coastal regions. In Bushehr, on the Persian Gulf, the mean relative humidity in the dry season is about 60% while in Kerman, which is far inland, it sometimes is as low as 8%. Therefore the summer weather in the Gulf area is very sultry.

The rainy period in most of the country is from November to May. The average annual rainfall is about 240 mm. Maximum amounts fall on the Elburz and Zagros slopes facing north and west respectively, which the mean annual rainfall is more than 1200 mm. Going inland, the ranges' of precipitation decreases to less than 100 or 50 mm annually. The amounts vary considerably with topography. In the northern and western mountains the annual mean precipitation is more than 480 mm; snow forms most precipitation. The plateau has most of its rainfall in spring, while on the western and southern coasts most of the rain falls in winter. In the Caspian coast, where the rain falls earlier, the rainfall is maximal in autumn. In the dry period between May and October, rain is rare in most of the country.

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CHAPTER 2. METEOROLOGICAL AND HYDROLOGICAL SERVICES

2.1 STRUCTURE

2.1.1 Headquarters

Government Department Ministry of Roads and Transportation
Service..... Islamic Republic of Iran Meteorological Organization (IRIMO)

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E-mail..... noorian@dci.iran.com

Permanent Representative Dr Ali-Mohammad NOORIAN
(Since 6 September 1994)
Vice-Minister of Roads and Transportation
President of IRIMO
Second Vice-President of WMO

2.1.2 Organization

The meteorological service was assigned to an independent organization in 1958, which has evolved into the present Islamic Republic of Iran Meteorological Organization (IRIMO). IRIMO is composed of eight divisions namely:

- Research and Scientific Investigation;
- Administration;
- Technical Services (laboratories, technical supervision, telecommunication services, electronic and engineering services);
- Network (climatological observation, agricultural observation);
- Operation (forecasting, synoptic observation, aeronautical control, marine meteorology, agrometeorological);
- Information and Data-processing (data-processing, data bank, publication);
- Training Department (training of Class I, II, III and IV meteorological personnel); and
- A Bureau in charge of the international meteorological affairs.

The country has been divided into 28 provinces, in each of which, IRIMO has established meteorological offices.

2.1.3 Staff and budget

Staff

The IRIMO's operational staff professional, sub-professional, clerical and support personnel as of December 1997 totalled 1,613 persons.

Budget

2.1.4 General fund contribution to WMO

(As of 30 November 1998)

Contributions paid (CHF)		Current arrears (CHF)		
1998	Total paid	1996 - 1997	1998	Total
306,067.00	0.00	376,939.00	306,067.00	683,006.00

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CHAPTER 3. TECHNICAL AND SCIENTIFIC PROGRAMMES

3.1 OBSERVATION

3.1.1 Basic observing networks

The total number of rainfall stations of IRIMO is 2420. In addition, the Ministry of Energy has its network of precipitation stations consisting of approximately 1619 stations.

The agrometeorological stations are equipped as climatological stations. In addition, they include measurements of crop growth and soil-moisture conditions. Soil-moisture is measured by gravimetric methods for four to five sets of samples of 10 cm each down to the depth of 70 cm. These measurements are performed approximately 20 times a year, usually before and after irrigation and after rainfall events (except during wintertime).

Most instruments are calibrated at IRIMO and the different types of stations are standardized according to international recommendations. Both recording and ordinary raingauges are used at the synoptic weather stations. They are not equipped with wind shields and data are not corrected for errors due to high wind speeds, etc. The rainfall stations are equipped with ordinary and Data loggers raingauges.

Twelve automatic weather stations are in operation and 10 of these were placed at each one of the regional centres. Data collected are transmitted directly to a microcomputer at the regional centres.

3.1.2 Space based sub-system

A meteorological satellite receiving equipment was installed at IRIMO in February 1992. This system receives METEOSAT low- and high-resolution images and NOAA high- resolution images. We upgraded the system in 1998 and now we have MDD and DCP RS receiver system. A time-lapse animation consisting of up to 60 pictures can be produced and a user can configure up to four separate animations. The system is used half-hourly to aid forecasters. Since it is a new system, much effort is being given to train local forecasters for its most efficient use.

Network of meteorological observation
(As of July 1998)

Type of station	No. of station	Remarks
Synoptic • RBSN-SYNOP • RBSN-CLIMAT • RBSN-TEMP	155 74 74 9	The network gives an average density of a synoptic station per 12,200 km².
Upper-air • Radiosonde • Pilot balloon • Two obs. daily • One obs. daily	13 11 2 1 12	
Weather radar	1	One 3 cm analogue radar in Tehran. Rainfall estimation is not possible.
AWS	12	
Agrometeorology sta.	22	
Climatology station	261	
Rainfall station	2420	
Aeronautical station	47	(Aeronautical Station+Synoptic Station lies in Airport)
Evaporation station	220	
Marine met. station • VOS • Buoy • Ship • Coastal station	 1 2 - 13	Purchased under UNDP project
Satellite receiving sta.	1	Located in Tehran-Mehrabad and installed in 1992
GAW • BAPMoN • Ozone	 1 1	
Others • Radiation station • Mountain station	28 1	66 Actiongraph

* RBSN: Regional Basic Synoptic Network
* AWS: Automatic Weather Station
* VOS: Voluntary Observing Ship
* GAW: Global Atmospheric Watch
* BAPMoN: Background Air Pollution Monitoring Network

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3.2 TELECOMMUNICATIONS

3.2.1 Automation of telecommunication system

Tehran is an Asian centre for collecting synoptic data and also the Regional Telecommunication Hub (RTH) Centre. RTH Tehran is automated. A level of automation of telecommunication system is as follows:

Computer system for telecommunication

- Main computer
  - DEC 3000-700 (installed in 1993), front end: DEC Server 3000
- Specification
  - Main memory size: 128 MB, Hard disk size: 381 MB
  - Operating system: VMS
  - Source of GTS application s/w: Vendor
  - No. of local terminals: 64
  - No. of telecommunication circuits: 44 (low speed of 50-600 bauds; 26 circuits, high speed of 1200-9600 bps; 18 circuits)
  - Capability for handling messages in bit-oriented form: yes, 4 MB/sec
  - Number and type of connections with other computers: 2 (Ethermet, Decmet)

Level of automation

RTH Tehran collects observational data from 155 synoptic, 11 upper air, 2 pilot wind finding, 9 automatic, 1 marine and 1 ozone meteorological stations using single sideband (SSB) and telegraph. Microwave communication is used for digital transfer of data from regional centres to the main centre in Tehran. There are 28 regional sub-centres which communicate through microwave transfer to their regional centre. RTH Teheran has an Automated Data Transmission System for the collection and dissemination of all observational data in accordance with the established schedules.

3.2.2 GTS circuits

RTH Tehran is linked to Jeddah and New Delhi as the main regional circuits and with Karachi as the regional circuit.

Status of implementation of GTS circuits

Circuits Tehran -	Type of GTS	Status of implementation	Future plan
RTH Jeddah	Main regional circuit	2400bps	9600 bps
RTH New Delhi	"	Satellite, 75 bauds, Alphanumerical data	9600 bps
NMC Baghdad	Regional circuit	Not implementation	9600 bps
Karachi	"	Satellite, 50 bauds, Alphanumerical data	9600 bps
Sana	"	Not implementation	2400 bps
Moscow	Interregional circuit	Disconnected	9600 bps

RTH Tehran

	Implemented	Future plan
Computer type of the main frame	OS/390	-
Computer type of the front ends	DEC 3000-700	-
Main memory size	128 MB	-
Hard disk size	7 GB	-
Number of the low speed circuit (50-60 bauds)	80	155
Number of the medium speed circuit (1200-9600 bps)	24 lines	-
Number of the high speed circuit (more than 9600 bps)	17 lines	27 lines
Number and type of RS 232 connection with local computers	40	60
Capability for detecting and eliminating duplicated bulletins	Yes	Yes
Automation of the monitoring application (notably for the annual global monitoring)	No	Yes

National Meteorological Telecommunication Network
(As of March 1998)

	Status of implementation	Future plan
Point-to-point circuits	80 (50 bauds)	120
HF SSB	120	-
X.25 circuits	17	-
HF broadcasts	3 RTT	1 FAX
Number of synoptic stations	197	-
Number of upper-air stations	13	-
PDUS	1	-
SDUS	1	-
MDD	1	-
NOAA HRPT	1	-
DCP RS	1	-
Telephone line	All station	-
VSAT (INTELSAT)	25	-
Facsimile	4	-
RTT HF receivers	10	-

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3.3 DATA PROCESSING

3.3.1 Level of automation

In the Computer Center of IR. of Iran Meteorological Organization (IRIMO) an ES 9000 computer system with OS/390 Operating System and more than 180Gb memory is used for operating raw data processing and setting up Meteorological database. The processing rate of this system is 82 MIP.

All collected data of meteorological stations which are quality controlled will be included to the IRIMO computerized data base.

IRIMO database contains of 20000000 data records since 1951, providing requested information for different end users, and support research projects in national and global level.

The archive of these data is available on a cartridge.

In addition of existing Mainframe, more than 220 Microcomputers are used for data decentralized processing.

About 200 Meteorological Applied Programs are provided in this center and used for data processing operations. Most of these programs have been written in FORTRAN language.

In addition to weekly, monthly and seasonal publications, precipitation analysis

are issued in this center and provided to applicants.

3.3.2 NWP activities

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3.4 WEATHER FORECASTING

3.4.1 Weather forecasting services

The forecasting reports issued by IRIMO's Weather Forecasting Centre range from some hours to a few days (maximum one week). The short-range forecasts which are valid for one to three days are used for mass media, agriculture, marine, and some governmental and private organization aviation activities. The medium-range forecasts up to one week are mostly issued for warnings to avoid damage to crops and for planning and programming irrigation, as well as other agricultural purposes.

The weather forecast reports with duration of less than 24 hours are provided based on surface and upper-air charts, satellite images received from METEOSAT-7 and Skew-T diagrams. In addition to actual synoptic charts, the numerical prediction charts, calculation of some important diagnostics such as vorticity and its advection, Q-vector, vertical velocity using different methods which have been designed in Tehran Forecasting Centre and analysed charts received from ECMWF are used to issue short-range (one to three days) forecasts.

Seasonal forecast for agriculture and water management is issued once a month with appropriate comments and early warnings.

Regarding the predictions of three days to one week, charts are received from ECMWF, Bracknell, Toulose and KWBC. The general predictions are issued in two ways: regular and by request.

Surface charts are prepared every six hours (at 00,06,12 and 18 hours). Upper air charts for 850, 700, 500, 300, 250 and 200 hPa are prepared (at 00 and 12 hours). Pressure difference charts, thickness charts, tropopause charts and maximum wind speed charts are prepared every 24 hours.

The forecasts consist of quantitative estimates of rainfall amounts, actual temperatures etc. based on experience, not on model calculations.

Weather forecasting (Nowcasting, short and medium-range)

Type of forecast	Frequency of issue	Users	Method of distribution
Storm warnings of expected dangerous weather and sea conditions and phenomena; sudden weather or sea state changes	as need	Mass media Governmental bodies Airline companies Regional Forecasting Centres	Telex Telephone Radio (AM, FM) Facsimile
Forecasting or reporting the hazardous weather phenomena for aviation purposes	as needed	Airline companies	Telex Telephone
Nowcasting (up to 6 hours) including weather phenomena, wind and temperature at surface and higher levels	as need	Airline companies	Telex Telephone
Short-range (up to 4-8 hours) including higher level information for aeronautical purposes	Four times a day	Mass media Governmental bodies Airline companies Regional Forecasting Centres Bulletin	Telex Telephone Facsimile
Medium-range weather forecasting (72-168 hours)	Twice a week or pre request	Governmental bodies	Facsimile Telephone Local Radio
Seasonal forecast	Once a month	Ministry of Agriculture & Energy	Facsimile Telephone Monthly Magazine

3.4.2 Dissemination of weather information

The daily hours of forecast issues, which are usually included in the news bulletins, are as follows:

Hours (Local time)	Medium
0700	to radio
0900	to newspapers
1000	to radio
0700, 1900, 2230	to radio/TV
2300	to radio

Several types of forecasts are distributed:

- Forecasts for TV and radio every 24 hours;
- Aviation forecasts to all the international airports in Iran every six hours for 24 hours ahead;
- Agricultural forecasts every 24 hours;
- Marine forecasts for the Persian Gulf and Oman Sea every 6 hours;
- Forecasts to the Ministry of Energy every 24 hours; and

- Forecasts for military purposes

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3.5 CLIMATOLOGICAL SERVICES

3.5.1 Computerized system for climate data management

There is a separate unit for climatological services in NMC and about 70 staff members are engaged in the climatological services in IRIMO.

Microcomputers and powerful PCs are used for climatological services. CLICOM was installed in February 1991 with self-funds. The status of CLICOM system is as follows:

Installed

- CLICOM status:
- Date installed: 1 February 1991
- Funding: Self
- Language: English
- CLICOM compatible data available: -
- Number of data reporting stations: -
- Approximate average length of duration of obs.: -
- Number of parameter archived: -
- Historical data via CLICOM: -

National Climatological Centre

The National Centre for Climatology (NCC) was inaugurated on 11 May 1996 in Mashad.

- Aims
  - Centralization of climate observations and climatological activities in the Islamic Republic of Iran in one national centre.
  - Making the climatological services applicable and improving these services for: “climate and water resources”, “climate and architecture”, “drought and desertification”, “climate classification”, and “climate change and its impacts on social and economic aspects”.
  - Quality control, processing and recording of climate data in a national centre on the basis of standard of the WMO.
  - Publication of the national climatological reports as daily, weekly, seasonal and annual bulletins and publication of “NIVAR” journal on a regular basis as a source of research data for weather and climate.

- Organization and Research Groups of the National Climatological Centre
  Experts, specialists and researchers with different background for organization, institutes and universities in Iran in groups of 3-6 person on the basis of national and provisional financial support cooperates with the centre as part time and conducts their predetermined researches to the component authorises of Meteorological Organization. Specialists required for this Centre should be in the following fields: physics, chemistry, air pollution, environment, development, architecture, industry, agriculture, mathematics, computer, biology, physical geography.

- Research Groups of the Centre
  - Research Group (1): Climatic controls and processes, Statistics and computerized services, International projects (CLIPS, CLICOM)
  - Research Group (2): Regional Climatology, Micro Climatology
  - Research Group (3): Climate and agriculture, Climate and problems of eater resources
  - Research Group (4): Climate and Architecture, Climate and building, Climate and problems of the cities, Climate and design

- Research Group (5): Climate and sport, Climate and tourism
- Research Group (6): Drought and desertification, Climate changes, Climate classification
- Research Group for Statistics and Scientific Publication:
  - Publication of statistical bulletins
  - Publication of weekly, monthly, seasonal and annual reports
  - Publication of charts and climate maps

- Computer unit, Data Bank and Publications
  There are four computers that are connected to the Computer Centre at IRIMO. All information on database and data processing are produced and offered to users and researchers.

- Teaching and Training Unit for Personal
  Teaching unit of the Centre has arranged several training courses. Recently with important Programs of National Climatological Centre approval of WMO has been selected as a Regional Meteorological Training Centre (RMTC) for training personnel in all classes. Shortly training courses in Applied Meteorology for class 2 and class 3 will be conducted in Khorassan Centre. Countries in the region like Newly Independent States of former USSR in the Caspian Sea border are able to send their experts to the Khorassan Meteorological Training Centre through the financial help of WMO, UNDP or UNEP.

- Important Programs of National Climatological Centre
  - Development of climatological stations network.
  - Improvement of climatological services for sustainable development.
  - Climate studies and prediction of the process of climate changes.
  - Evaluation of climate impact on human and environment.
  - Tracing pollution particles in the atmosphere.
  - Studying the greenhouse gases and their effects on the warming of the earth.
  - Studying the effects of human activities on climate.
  - Development of the applied climatological services.
  - Supporting of regional cooperation and establishment of the regional climatological networks
  - Cooperative research on climatology with the Middle East countries.
  - Conducting researches on aviation climate, sea climate, agriculture climate, air pollution and environmental protection
  - Implementation of the International commitments based on Agenda 21 and Rio de Janeiro Declaration and also commitments for Climate Change Convention.

3.5.2 Data storage and climatological publications

All meteorological observation data and weather information are published in several types of publications. Since 1980, a total of 33 publications have been issued. The major publications are;

- *Meteorological Yearbook*
- *Nivar Quarterly*
- *Monthly Weather Summary from Synoptic Stations*
- *Weekly Weather Reports*

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3.6 APPLICATION OF METEOROLOGY

3.6.1 Level of activities

Marine meteorology

IRIMO is conducting the following activities in its Marine Meteorological Network Stations in northern and southern waters.

- Marine Meteorology in the Caspian Sea
  - Operating five on-shore synoptic stations on the Caspian Sea coast which are equipped with marine meteorological equipment
  - Directing Marine Meteorological Forecasting Centre in Bandar Anzali
- Marine Meteorology in the South (Persian Gulf and Oman Sea)
  - In 1999, there are eight synoptic marine stations which are operational: in Cha Bahar, Jask, Lengeh, Gheshm,Dayer,Bushehr, Siri Island and Abu Musa. Furthermore, eight ships have been equipped with marine instruments which report the observed parameters related to waves, temperature of sea water, etc..
  - Since 1994, the Islamic Republic of Iran has begun to issue forecast bulletins for the north of Persian Gulf region within the NAVTEX framework.
  - Implementation of 2 wave-recorder buoys in the Persian Gulf and Oman Sea

Agrometeorology

In 1999, 22 major research agrometeorological stations were operational and will increase to 18 stations. However, IRIMO is also planning to increase the number of supplementary agrometeorological stations up to 34 stations.

Agrometeorological experts in different provinces operate these stations and conduct research projects on 15 strategic yields in two ways as follows:

- Observation
  In agrometeorological stations, the parameters such as phenology and biometry on yields, meteorological parameters, and soil related factors are regularly observed.
- Researches
  In this regard, the agrometeorological experts using statistical procedures analyse the data and determine the effect of atmospheric variations on the growing process of the yields. The outcomes of these projects are published in a ten-day, monthly and seasonal specialized bulletins.

The Agrometeorological Department of IRIMO has appropriated part of its technical and scientific potential to serve farmers. In this connection, a Committee called “Agrometeorology” has been established which issues agrometeorological weather predictions and warnings twice a week which are then broadcast through the mass media.

Others

Meteorological and climatological data and information are widely utilized in various fields such as energy, transport, tourism, etc. In particular those are used for studies on the control of desertification by planting and sparkling Tor and Mazut in central Iran.

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3.7 HYDROLOGY AND WATER RESOURCES

3.7.1 Structure

Hydrological Adviser to PR of Iran with WMO

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Dr N. ROSTAM AFSHAR
Water Resources Research Organization, Ministry of Energy
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- Dr N. ROSTAM AFSHER: Rapporteur on Management of International Rivers, Ministry of Energy
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- Mr Hedayat FAHMI: Ministry of Energy

3.7.2 Hydrological services

Systematic monitoring of the surface water resources of Iran began in 1945, although measurement of flow in the Karun River began in 1982. Fairly accurate data were also collected for the Karkheh and the region around Tehran. A surface water department was set up in 1945 within the independent irrigation corporation. Hydrological data collected by it were used in various development projects, such as construction of 14 storage dams and 34 flow diversion and regulation dams. Surface water and groundwater resources in Iran having interrelated their monitoring and assessment activities have been combined and placed within the Water Resources Investigation (WRIB) under the Ministry of Energy.

WRIB is responsible for the planning and supervising of water resources data, surface water, groundwater and meteorological data necessary for water resources assessment.14 Water (and Power) authorities are responsible for the execution of the programmes of the Ministry. The largest water authority is situated in Khuzestan.

WRIB is divided into three departments:

- Surface Water Department;
- Groundwater Department; and
- Data Analysis and Coordination Department; 5 Branches (Mathematical modelling, Hydrological and hydrogeological atlases, Experimental and representative basins, Hydrological forecasting and warning stations, Artificial recharge of groundwater).

Network of stations

As in 1991, the surface water network consists of about 1100 stations observing water levels for computation of discharge. They can be divided into three different categories:

- 350 class A stations which have a staff gauge, a water level recorder, cable arrangements for discharge measurements and normally a raingauge;
- 400 class B stations which has a staff gauge and a recorder or a cable arrangement for discharge measurements;
- 350 class C stations which only has a staff gauge.

At all the stations water samples are collected for chemical analysis and

approximately 500 of the stations include sediment discharge measurements. Discharge measurements and calculations are performed by specialists at each water authority. The responsibility of final checking of data lies with WRIB in Tehran.

The discharge stations give an average density of one discharge station per 1500 km , which is acceptable for flat regions. Even though Iran is a country with extensive mountainous regions, the network density roughly meets the WMO normal for general planning purposes.

WRIB has its own network of meteorological and climate stations for hydrological purposes. Data acquired from these stations are used for calculating water balance for specific catchments. This network consists of the following types of stations:

- 400 meteorological stations also equipped with class A evaporation pans;
- 600 stations with ordinary raingauges;
- 700 stations with storage raingauges.

Snow surveys are performed using Canadian equipment. Point measurements are made along 900 m long courses at several places in some catchments. These measurements are performed about once a month during winter resulting in two or three measurement a year.

Data processing

The observed data are presented in yearbooks which contain data analyses. Data have been analysed and presented in the form of atlases covering at least the following topics; surface hydrology, hydrology, water quality and groundwater exploitation. Data are stored in a computerized data bank which is PC-based. The Ministry would like to update and modernize the system.

Data transmission

WRIB does not have any station with real-time data transmission. In Khuzestan, however, some stations at dam sites have telephone connections. The Ministry is trying to establish a data transmission system between the water authorities and the Ministry in Tehran. The idea is that local data bank at each water authority communicate directly with the central data bank in Tehran. Further plans are to establish a telemetering network covering the whole country. 300 stations have been selected for this purpose and different solutions to the transmission problem are being examined.

Flood forecasting

The only forecasting activity at the Ministry of Energy is for irrigation planning

during the crop season. The basic for this type of forecasting is snow surveys in the upper parts of the catchments performed during the winter, typical rainfall patterns selected from historical records (wet, dry and average years) and estimated water demand for different purposes in the inhabited and cultivated parts of the river basins. The influence of snowmelt is estimated from typical temperature variations and degree-day type of snowmelt models. Reservoir operations are simulated with models like HEC-3 and the final results are forecasts of shortages in the water supply during the crop season.

All hydrological modelling make use of purchased software packages and no model development and programming activities in this field is performed. In addition to the already mentioned use of HEC-3 for reservoir simulations, hydrogeological modelling is also represented. This modelling is based on finite difference methods and is used to forecast the changes in groundwater aquifers caused by human activities (groundwater retrieval, etc.) and climate variations.

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3.8 RESEARCH ACTIVITIES

3.8.1 Participation in major international research projects

3.8.2 Major national research projects

The Oceanic and Atmospheric Research Centre was established in 1989. The Secretariat-General of WMO inaugurated the opening of the Centre.

3.9 EDUCATION AND TRAINING

3.9.1 Training facilities

There are four regular training courses; two for class I meteorologists provided by the University of Tehran, and other two for class II and III provided by the Institute of Meteorology and Atmospheric Science.

- Postgraduate course leading to M.Sc. in meteorology by Geophysics Unit of University of Tehran: 28 months (including research and thesis), English
- Postgraduate course leading to M.Sc. in agrometeorology by Agricultural College of University of Tehran: 2-3 years (including research and thesis), English/Persian
- B.Sc. course in meteorology for class II personnel at the Institute of Meteorology and Atmospheric Science: 4 years, Persian/English
- Training course for class III personnel of operational service at the Institute of Meteorology and Atmospheric Science: 2 years, English/Persian. This course is conducted to provide operational staff for IRIMO.

Following the decision taken by WMO Executive Council, the World Meteorological Organization has recognized the establishment of the Regional

Meteorological Training Centre (RMTC) in the Islamic Republic of Iran in 1993 in accordance with the recommendation of the tenth session of Regional Association II (Tehran, 1992). In 1994, the Advanced Meteorological Services Training Centre in Tehran was designated as a WMO RMTC.

3.9.2 Manpower development plans

The training of personnel and meteorologists takes place at the Higher Education of Meteorology and Atmospheric Science Centre in the IRIMO. Due to the specialized and technically complex nature of IRIMO's operation, it lays great emphasis on staff training, which is primary provided by the Centre. It has presented a number of short courses in management skills, arranged involvement in several development programmes and assisted all categories of staff with accredited studies.

3.9.3 Activities of RMTC

The quadrennial symposium on Education and Training in Meteorology and Operational Hydrology was held in Tehran, Islamic Republic of Iran (November 1999).

Also, the meeting of Directors/Principals of RMTC's was held on 11 November 1999 in Tehran, Islamic Republic of Iran. In this meeting Dr. A. Sedaghatkerdar from the Islamic Republic of Iran was elected as RMTC's Representative with the coordinating committee of SCHOTI (CO-COM).
The Fifth meeting of the SCHOTI was held in Tehran, Islamic Republic of Iran 9 November 1999.

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CHAPTER 4. TECHNICAL CO-OPERATION AND DEVELOPMENT PROJECTS

4.1 UNDP/WMO PROJECTS

Country project

The following UNDP country project was completed successfully.

Title	Development of Agrometeorology and Marine Meteorology
Duration	1989-1993
UNDP input	US$ 694,000
Objectives	To provide advanced and high technical system for agrometeorological and marine meteorological services
Implementation	Expert services in marine meteorology for 12 months and in agrometeorology for 17 months Provision of equipment including meteorological satellite receiving system, two buoys, training aids and CLICOM software 146 m/m training abroad for 24 personnel

A trust fund agreement between IRIMO and WMO for the implementation of technical assistance project was signed on 1 May 1997. The immediate objective of this project is to increase the capabilities of the IRIMO to comply with its national and regional obligations through technology transfer and manpower development. This project is being carried out for four years and started in June 1997.

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4.2 WMO/VCP, RB AND BILATERAL PROJECTS

4.2.1 WMO/VCP projects

Iran has so far received only one assistance under the VCP programme.

Projects completed
(As of)

Completed	Indicator	Year	Project title	Donor	Cost
1. 9. 1977	TE/5	1969	Links to NMCs/RTH/WMCc and broadcast from Tehran RTH	VCP(F)	

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CHAPTER 5. OTHER ACTIVITIES RELATED TO WMO PROGRAMMES

5.1 HOLDING OF WMO MEETINGS, SEMINARS AND WORKSHOPS

Title	Place and date
10th session of RA II	Tehran, 5-16. 9. 1992
Familiarization Visit of Directors of national Meteorological and Hydrological Services of Central Asian Countries to IRIMO	Tehran, 3-7. 9. 1994
First Session of the Coordinating Committee on Hydrometeorology and Pollution Monitoring of the Caspian Sea	Bandar Anzali, 30/9-3/10 1995
First Regional Conference on Climate Change	Tehran, 21-23. 5. 1996
Second Session of the Coordinating Committee on Hydrometeorology and Pollution Monitoring of the Caspian Sea	Baku, 10-15 2. 1997
Third Session of the Coordinating Committee on Hydrometeorology and Pollution Monitoring of the Caspian Sea	Tehran, 21-23. 4. 1998
Workshop on Capacity Building for Asian Countries	Tehran, 22-26.11.1998
RA II Working Group on Agricultural Meteorology	Tehran, 4-6. 9. 1999
Fourth Session of the Coordinating Committee on Hydrometeorology and Pollution Monitoring of the Caspian Sea	Tehran, 7-8. 9. 1999
WMO Symposium on Education and Training in Meteorology and Hydrology	Tehran, 6-10. 11 .1999
Second Regional Conference on Climate Change	Tehran, 4-5. 11. 1999

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5.2 PARTICIPATION IN THE WORKS OF OTHER WMO PROGRAMMES

A National Committee for Natural Disaster Reduction was set up in 1988 as part of the IDNDR project. It is headed by the Interior Minister and includes representatives from several government agencies, including IRIMO.

Executive Council

Dr Ali-Mohammad Noorian: Second Vice-President
Chairman, EC Advisory Group on Climate and Environment
Chairman, Meeting of President of Technical Commission
Member, EC Advisory Group of Experts on Technical

Cooperation

Regional Association II

Dr G.A. KAMALI: Chairman, Working Group on Agricultural Meteorology

Technical commissions

- Commission for Agricultural Meteorology (CAgM)
  Prof. A. ALIZADEH: Joint Rapporteur on Validation of Information Requirements on Irrigated Soils and Crops

- Commission for Climatology (CCl)
  E. FARMAN (Ms): Rapporteur on GTS and Internet Utilization

Secretariat staff: 1 (as of 31 December 1997)

Technical Commissions
(As of February 2001)

Field	Name	Address
CBS	B. SANAEE	Iranian Meteorological Organization
	B. VAZIRI	"
	K. BASTANI	"
	M. BEHNAMJOU	"
	M. JABBARI (Mrs)	"
	M. PEDRAM (Mrs)	"
	M.R. VAEZ GHAEMI	"
	MORTAZAVI (Mrs)	"
	M. KHOSHKAM (Mrs)	"
	VAZIFEH	"
	H. VALAD KHANI	"
	A. TAGHIPOOR (Mrs)	"
CIMO	M. JOORABCHI	Iranian Meteorological Organization
	N. CHINI FOROOSH	"
	HOSSEINZADEH	"
	E. FARMAN (Mrs)	"
	M. REIHANIPARVARI	"
	E. SADEGHABADI	"
CAS	Dr. A. SEDGHAT KERDAR	Iranian Meteorological Organization
	Dr. S. JAVANMARD	"
	Dr. H. BASIRPARASA	"
	V. ESFAHANIAN	"
	M. MORADI	"
	Z. JAHANGIRI (Mrs)	"
CAeM	D. PARHIZKAR	Iranian Meteorological Organization
	R. REZADEH	"
	M. IRANBODI (Ms)	"
	S. TAJBAKSH (Ms)	"
	F. SAHRAIAN (Ms)	"
	M. MORADI	"
CAgM	Dr. G.A. KAMALI	Iranian Meteorological Organization
	H. ABARGHOYEE	"
	K. NOOHI (Mrs)	"
	Dr. M. BAGHER BEHYAR	"
	M. RAHIMI	"
	N. GHAHREMAN	"

Field	Name	Address
JCOMM	Dr M.T. ZAMANIAN S. NAHID (Mrs) M. ESMAEELI (Mrs) A.E. SARKARDEH M. ZOLJOUDI V. IKANEE	Iranian Meteorological Organization “ “ “ “ “
CHY	P. BADIEE J. MESBAHI H. FAHMI Dr. H. GHAEMI F. RAHIMZADEH (Mrs) E. FATAHI M. AMIR SHAGHAGHI	Iranian Meteorological Organization “ “ “ “ “ “
CCl	Dr. J. BODAGH JAMALI ASGARI A.H. DELJU Dr. M. EMAMHADI (Mrs) L. KHAZANEHDARI (Mrs) M. HABIBI NOKHANDAN	Iranian Meteorological Organization “ “ “ “ “

Secretary-General's visit

Date	Purpose
6 - 9. 10.1989	By the invitation of the Iranian Government
4 - 9. 9. 1992	In connection with the participation in the 10th session of RA II which was held in Tehran from 5 to 16 September 1992
2 - 7. 9. 1994	To address the meeting on Mutual Cooperation between the Hydrometeorological Services of the Islamic Republic of Iran and some of the Newly Independent States
26 - 28. 9. 1997	To address the inauguration of the International Training Course on CLICOM which was held at RMTC in Tehran To sign a Trust Fund Agreement for the enhancement of the weather radar network in Iran
3-6. 11. 1999	To address the 2nd Regional Conference on Climate Change and the WMO Symposium on Education and Training in Meteorology and Hydrology
20-25.10.2000	12th General Meeting of the Third World Academy of Sciences (TWAS)

PR's visit to WMO

PR	Date	Purpose
H.A.Taravat	1. 1993	As president of RA II for the purpose of familiarization with WMO functions and discussions of matters of both interests and concerns to RA II.
H.A.Taravat	4. 1994	Consultative Meeting on the proposals of the Study Group on the Technical Co-operation Programme
A . M . Noorian	4. 1994	Visit to WMO, Geneva
A . M . Noorian	7. 1994	2nd Session of the E.C. Working Group on Long-Term Planning Financial Advisory Committee Executive Council – 46th session
A . M . Noorian	9 .1994	Conference on the Economic Benefits of Meteorological and Hydrological Services
A . M . Noorian	9. 1994	First Vice Presidental Campaign
A . M . Noorian	4. 1995	WMO/ UNDP Donors' Meeting in support of National Meteorological and Hydrological Services (NMHSs) of the Newly Independent States (NIS)
A . M . Noorian	7. 1995	WMO Twelfth Congress
A . M .	7. 1996	48th Session of Executive Council

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PR	Date	Purpose
A . M . Noorian	4. 1997	Discussion on Radar Network with WMO SG
A . M . Noorian	7. 1997	49th Session of Executive Council
A . M . Noorian	3. 1998	Appointment & Discussion with WMO SG
A . M . Noorian	7. 1998	50th Session of Executive Council
A . M . Noorian	1. 1999	Implementation of IRIMO Radar Project
A . M . Noorian	5. 1999	WMO Thirteen Congress & EC LI
A . M . Noorian	10. 1999	Meeting of Presidents of 8 Commissions of WMO
A . M . Noorian	1. 2000	Meeting of Representative of EC and Session of Bureau
A . M . Noorian	5. 2000	Fifty Second Session of EC
A . M . Noorian	10.2000	2000 Meeting of Presidents of Technical Commission

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CHAPTER 6. SUMMARY

6.1 REQUIREMENTS

Many efforts are being made to develop and improve the capabilities in meteorological and operational hydrological services in Iran. As part, the UNDP project proposal entitled " Strengthening of the Flood Forecasting System in Iran" was discussed in September 1992 during the TPR meeting of the recently completed UNDP project in September 1992. It was agreed in principle by UNDP on the condition of the cost sharing with IRIMO. For the successful implementation of the project, close cooperation with authorities concerned is required.

Iran is very keen to host a WMO Regional Meteorological Training Centre in Tehran, to cater for the training needs in the field of meteorology, in particular in oceanography of Members in the Region. This intension was expressed several times and discussed at the 10th session of X-RA II held in Iran in 1992.

In 1994, the Advanced Meteorological Services Training Centre in Tehran was designated as a WMO RMTC.

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