9. **A new Climate data management system** including quality control, at HQ and in the NCRI centre in Mashhad, for higher efficiency in data management, more timely and up to date production, interfacing to GIS, and better working environment for people studying climate change.
10. **An extended production system to end-users**, including TV presentation system and web-based production system for increasing number of users in all fields. Such system to be installed at HQ and in provincial centres

11. **An operational capability to run atmospheric model** over Iran and surrounding countries in a secured computing environment, after technology transfer from Météo-France
12. **An operational capability to run sea state and sea pollution models** in a secured computing environment, after technology transfer from Météo-France
13. **An operational capability to run environmental model** over Iran in a secured computing environment after technology transfer from MF

3.4. HeadQuarters

Headquarters will benefit from a significant upgrade and rationalization of data management and production tools

All critical IT centre and telecommunication systems will be located in a single "computer hall" in IRIMO HQ close to Mehrabad Intl airport. This includes central NWP computing power. All systems will be gathered in one single room, as expected by IRIMO. This will help system administration and overall reliability.

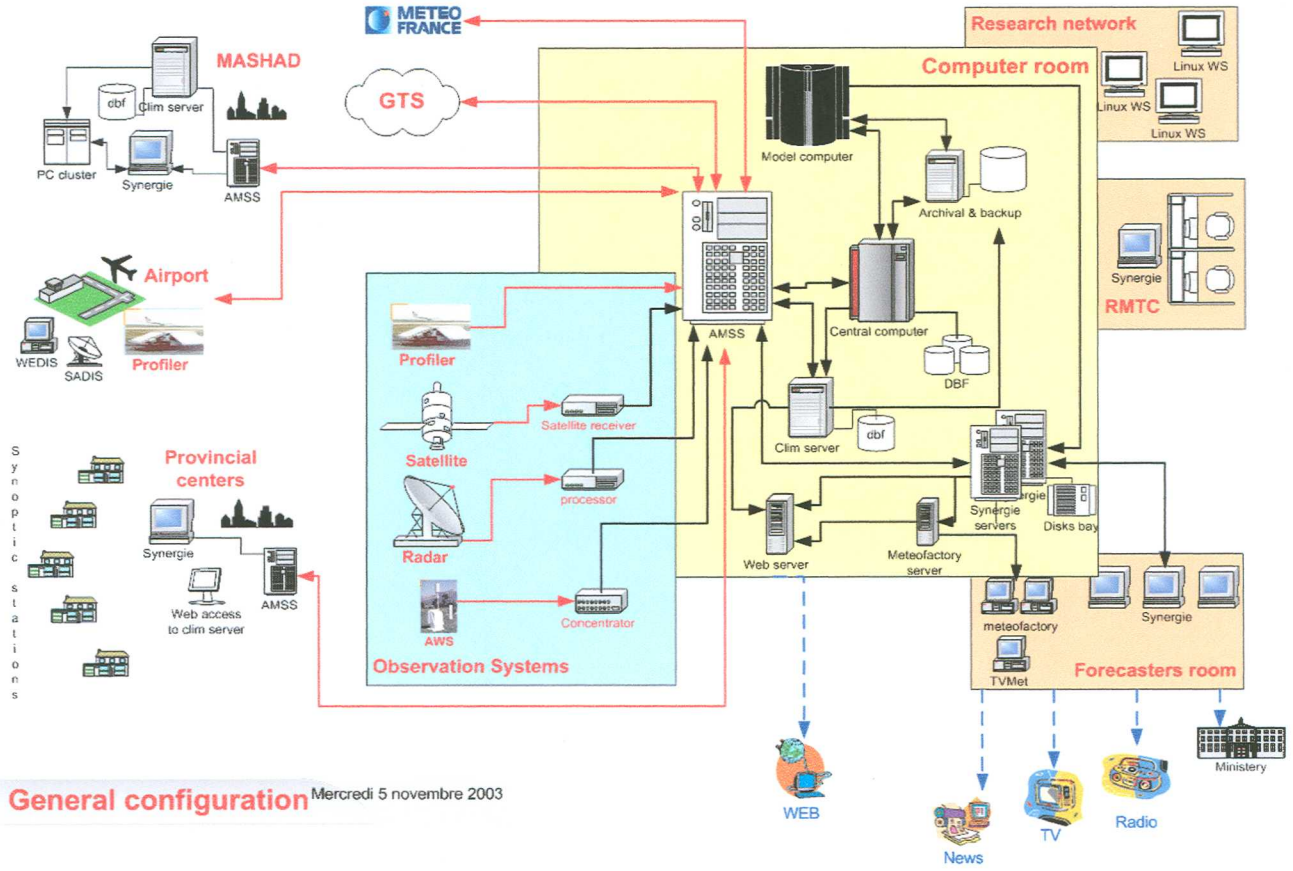
The central upgraded AMSS will be located in the computer hall as well and will be the linking system with outside world (including foreign and provincial centres).

Symmetrically, all forecasting related systems will be located in another unique area, mixing general and specialized forecasting positions (general, marine, aviation, ...) forecasting, production to end users and to medias.

The climatological data management system will be part of the whole Information System and allow powerful data management and quality control together with automatized professional production to authorities or end-users.

All systems in HQ will be installed on top of a powerful LAN (most of it exists already).

Powerful telecommunication system will be implemented between HQ and provincial centres, radar sites, airports, and main user sites. Data collection from observing sites is also considered in the telecommunication issue.



3.5. Provinces

A major part of the MITD Project (more than 55%) is dedicated to the enhancement of Province capability in meteorology : observation networks and maintenance, airport system update, radar implementation, telecommunication means, and of course forecasting and data processing facilities, together with development and study capability.

Due to significant improvement in those fields, provincial centres will be in a better position to act as major local players, in full complementarity and coordination with HQ level.

3.6. Specialized centres

- **Mashhad CRI** : this centre will still concentrate on main climate studies, thanks to a dedicated national data base mirrored from the reference system in Tehran, and will also be able to continue fundamental research work on numerical weather prediction thanks to a fitted working environment and powerful telecommunication link with Tehran. Nevertheless, it is likely that this centre will not be the one transferring research to operations in this NWP field, due to geographical distance
- **Tehran RMTC** : This training centre will benefit from a telecommunication link with HQ and a full training room in atmosphere dynamics, based on the real time or in-box data investigation, allowing students to get familiar with modern concepts in dynamic meteorology as well as being trained to operational forecasting.

- **Tehran OASC** : this centre dedicated to Oceanography will benefit from a working environment and link with IRIMO HQ, enabling research people to tune the sea state and oil pollution model before transfer to operations.
- **Tehran ASMERC** : This centre could be the one hosting the research team in charge of cooperation with Météo-France and of transfer to operations. They will also have a fitted working environment enabling distant model runs on the computing power available at HQ. They could be the direct interlocutor of the forecasting department at HQ.

3.7. MITD main components

Surface observation

Main Principles	Although surface observation is of good quality at IRIMO, improvements have to be brought in several fields : First the quantity and timeliness of data delivery for the benefit of Numerical Weather prediction, weather watch and forecasting, as well as climatology. This requires a significant automization of the observing network, starting with synoptic stations in provinces already equipped with maintenance workshops. Besides, automization of the network should also contribute to the real time calibration of the whole radar network (see §4.2.5), thus enabling a reliable use of this equipments for weather watch, risk management and hydrological purposes. Also IRIMO wishes to develop in specialized meteorology such as aviation, road, marine or environment. Aviation is tackled in a specific subproject (cf §4.2.2), but the other domains will require some specific subnetwork, to be designed and implemented in full complementarity and consistency with the core surface network. Besides, some cargo ships routeing in Caspian Sea or in the Gulf and selected by IRIMO could be equipped with automatic weather stations, for better coverage and marine forecast verification. In all cases, the observing network will be implemented only after checking or setting up the telecommunications facilities. As a result, the observing network will involve national, provincial and local levels, with special emphasis on provincial capability in network administration & maintenance. It is planned to implement most of the new network in Phase 2, after the IT and Telecom infrastructure is implemented. Nevertheless, a significant part of this subproject should be started as from Phase 1 in pilot provinces (where maintenance structure is already available). Complementary optimization study will be also led during this phase, from IRIMO datasets.
General design	The different subnetworks will rely on : - Data concentration systems (to be installed in each of the 28 provincial centres OR in main provincial centres) to be connected to the local communication facilities (AMSS) for further connexion with HQ

	national AMSS. - Semi automatic weather stations for manned sites (synoptic, agrometeorological, and airport stations). - Automatic weather stations (unmanned sites) for road and complementary stations, with specific telecom - Marine observing systems (coastal stations, marine stations on board selected ships, buoys) - Pollution stations in limited number complementarily to the network already managed by Environmental Protection Agency (to be confirmed)	
Quantities* *(indicative values only ; see detailed scope of supply)	AWS semi automatic AWS automatic (complementary, climatological) Road meteorology Environment/pollution Marine coastal stations Marine : selected ships Data concentration systems (main province) Data concentration licence (national)	120 60 5 12 5 5 10 1

Airport systems

Main Principles	Aviation meteorology is among the main applications of meteorology. The purpose of this action is to strengthen the safety of airports in Iran and to upgrade IRIMO to highest ICAO standards. It is proposed to complete implementation in major airports in Phase 1, covering international (Mehrabad, Emam Khomeiny) and main regional airports. The rest of airports will be equipped in Phase 2. The proposed equipment correspond to minimum requirement from ICAO. It will be completed where relevant with wind profilers for wind shear detection, rainfall radar, or upper air sounding facility.	
General design	Airport systems generally include AWOS (Automatic Weather Observing System) and pilot briefing systems. AWOS are implemented along the main runways and are more or less sophisticated depending on the airfield category. Data from AWOS are made available to the local control tower and to GTS through IRIMO WAN. Pilot briefing systems rely on relevant available data flow. They are used for flight folder preparation. They require a link to the IRIMO WAN.	
Quantities*	**AWOS** for : Mehrabad & E. Khomeiny Intl airports Major regional airports Secundary airports	 2 5 5
*(indicative values only , see detailed scope of supply)	**Pilot briefing system** for : Mehrabad & E. Khomeiny Intl airports Major regional airports Secundary airport	 2 5 5

Satellite reception systems

Main Principles	As IRIMO as already updated satellite reception systems (Msat5 PDUS and MSG LRIT system), it is proposed only to integrate the existing systems into the main Information System so that all data and products are made available to subsystems throughout the country. The integration will take place in an early phase of the project. IRIMO has expressed no special need for renewal of its HRPT systems. Therefore there will be no HRPT data in the IRIMO Information System.	
General design	Integration to Information System. The geostationary data will be sent to the updated AMSS at HQ, in order to be routed to any other place or processing system. Archiving policy will also be set up.	
Quantities	Integration of existing system to IRIMO Information System	1

Upper-air observation

Main Principles	IRIMO intended to increase the number of upper air observation sites significantly. This for general forecasting purposes, numerical weather prediction model quality, and international cooperation. As a matter of fact only 1 or 2 additional stations are needed to meet the highest standards and it is therefore proposed to implement one close to Caspian sea and one near Pakistan. Complementarity between upper air sounding systems and wind-profilers will be sought. The resulting network will be implemented all along the Project, on a regular basis. The existing upper air network, based on traditional upper air sounding systems should also be updated as analog technology is getting obsolete and replaced with digital systems.	
General design	The additional upper air sounding systems will be from the latest generation and will include hydrogen generators on each new site. The existing stations will be upgraded to manage digital processing with lower running costs for IRIMO. The wind profilers will be implemented in drier and sensitive areas for aviation (turbulence), complementarily to the radar network (except in the Tehran region). Resulting data will be made available locally and also to GTS for further use at IRIMO and international level (data assimilation).	
Quantities*	Full upper air sounding systems : update New upper air sounding systems hydrogen plant	10 2 1
**(indicative values only ; see detailed scope of supply)*	Wind profilers	3

Radar network

Main Principles	The implementation of a radar network over Iran must meet the following criteria : improve real time weather watch and early warning capability over densely populated and/or weather sensitive areas. The proposed network stresses on sensitive regions in the North of the country mainly and brings the best continuity in view of the use of an operational composite radar picture at HQ and provincial centres. It is also important to have a minimum operational investigation in the huge amount of data available locally. This constraint together with the logistic constraint (availability of power supply, telecom, road infrastructure, ...) and the requirement for maximum reliability made us propose a compromise in radar locations : non-optimum sites (in the strict sense of radar coverage) are likely to be selected in this view. Important also is the integration of all existing and future radars into a

	consistent radar network. The Project includes the integration of the radars delivered through both MITD and through the so-called WMO project. The integration will be made mainly through common telecommunication solution, data selection at the radar site, real time calibration, maintenance, management of "standard" formats, inclusion in central Information System and forecasting tools, and archiving policy. Site implementation will follow a territorial continuity and slight redundancy principle, starting from north-west part of country southward over the whole duration of the MITD Project. Radar calibration is also a specific issue. A common procedure will be set up and applied to each site at regular intervals, based on implementation of automatic rain gauge in this respect. Phase 1 should be the opportunity for setting up the nationwide production, integration of the first WMO radars, and implementation of 2 radars in the field. Phase 2 will allow the implementation of the remaining radars, and lead to a total comprehensive network of about 12 radars in the country.	
General design	It is proposed to aim a full network consisting mainly of C-Band Klystron radars. The manufacturer will deliver the sensor (radar) itself with aerial and radome, together with operation and local processing software. Dual polarization could be investigated in some places, depending on success of this type of implementation in an earlier stage. Exchange of experience will be performed with Météo-France on this topic. IRIMO will be in charge of civil works (radar tower), from installation files and engineering documents provided by the Consultant.	
Quantities*	Complementary C-Band radars	5
*(indicative values only ; see detailed scope of supply)	Integration and calibration procedures Networking and nationwide production capability	11 1

Domestic & international telecom (Wide Area Network and Local Area Network)

Main Principles	Data to be exchanged at a national level will grow significantly during the project, due to - higher amount of observed data (automatic stations, radars, ...) to collect - increasing needs for observed and forecast data at provincial level - modelling capability at Irimo HQ At least the following centres (>100) should be interconnected through reliable high-speed connection: HQ (>1), provincial centres (>28), airports (>12), radar sites (>12), some AWS (>35), specialized centres (>5).

	Before the end of the MITD project, telecommunication means should enable IRIMO not only to collect data from the field, but also to disseminate its own added value data (nationwide composite radar products, NWP and marine model output, satellite pictures, forecast guidance, ...) throughout the country and also to surrounding countries. At HQ and provincial centres, the existing communication subsystems (AMSS) will be upgraded in a way to be able to manage a wider spectrum of data types and much higher amount of data. Smaller AMSS could also be implemented in provincial centres with double location (such as Esfahan).	
General design	The topology of the telecommunication network will mainly rely on satellite based solutions, due to the remoteness of some observation sites (radar sites) and to the cost effectiveness of such solutions in Iran. The implementation of the full network will be done in a step by step approach, with priority given to implementation of high speed connexion at provincial centres and airports, and upgrade of HQ and provincial AMSS at the beginning of Phase 1. IRIMO has already launched a VPN project to connect the Provincial centres to HQ at 64kb/s. Depending on the success and cost effectiveness of the final VSAT solution to be implemented, the VPN links will be kept (as back-up) or not by IRIMO. Before IRIMO is in position to run its own models, the models will be run in France and their output sent to Iran. During this transition period, and before a full VSAT system is implemented IRIMO could rely on the Meteo-France RETIM dissemination system to receive data at provincial centres and airports. The full dissemination capability should be given to IRIMO through possible implementation of a telecommunication Hub enabling reliable uplink. Such decision will be made at Ministry level. In such case, the Hub would be the core element of the Joint Ministry-IRIMO VSAT system.	
Quantities* **(Indicative values only, see detailed scope of supply)*	**Upgrade of HQ AMSS**	**1**
	Upgrade of Provincial AMSS	**28**
	Extra AMSS	**< 3**
	VSAT 2 way receivers & file server (HQ)	**> 1**
	VSAT 2 way receivers (Provinces)	**< 28**
	VSAT 2 way receivers (Airports)	**< 12**
	VSAT 2 way receivers (Radar sites)	**< 12**
	VSAT 2 way receivers (remote obs. Sites)	**< 35**
	VSAT 2 way receivers (Other sites)	**< 5**
	VSAT file transfer licence national	**1**

Information system incl. data management system & computing facilities