



**NATIONAL REPORT**

**OF THE**

**ISLAMIC REPUBLIC OF IRAN**

**ON**

**DISASTER REDUCTION**

World Conference on Disaster Reduction

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# **Chapter 1**

## **Introduction**

The Islamic Republic of Iran is situated in south-west Asia and covers an area of 1,648, 000 square kilometres. Located on the world dry belt, 60 percent of Iran is covered with mountains and the remaining part is desert and arid lands. Due to its location, Iran is a disaster prone country. Among the 40 different types of natural disasters observable in different parts of the world, 31 types have been identified in the Islamic Republic of Iran. Major natural disasters include frequent serious earthquakes, floods, droughts, landslides, desertification, deforestation, storms and the like.

Earthquakes take a heavy toll. Iran is part of the Alp-Himalaya orogenic belt and is known as part of the youngest and last orogenic regions of the world. As a result, Iran suffers severe economic and social damages resulting from seismic activities within its territory. Earthquakes have killed more than 180 000 people during the last 90 years. Many cities including Tehran, Tabriz, Rudbar, Manjil, Tabas, Lar, Qazvin, Zanjan, Hamedan, Kermanshah, and Fars have sustained substantial damages due to high magnitude earthquake activities. Review of the historical seismic data shows that almost all parts of the country are affected by the physical, social and economic problems associated with earthquakes. The most recent major earthquake measuring 5.6 on the Richter scale struck the historic and agricultural city of Bam in the south eastern Iranian province of Kerman killing more than 30000 people, leaving more than 10000 people injured and more than 100000 homeless. About 80 percent of the houses in the region were destroyed and serious devastation was inflicted on the urban and rural infrastructure, causing over 800 million US dollars worth of damages. It is feared that a major earthquake in Tehran, a megalopolis of over 10 million inhabitants, situated on a number of major faults, could well lead to considerable loss of life and substantial financial damages if appropriate mitigation measures are not introduced.

It is worth mentioning that due to the political, social and economic stability of our country in the region, Iran has been the largest refugee host country for more than a decade and thus Iran regularly deals with complex human emergencies on top of all the natural disasters. The 31 types of natural disasters affecting the country are as follows:

1. Earthquake
2. Liquefaction
3. Tsunami

4. Ground surface upwelling
5. Mudflow
6. Landslides
7. Rock falls
8. Slumps
9. Soil erosion
10. Forest Fires
11. See Water level Fluctuation
12. Sedimentation
13. Coastal degradation
14. Marsh encroachment
15. Desertification
16. Cold and Frustration
17. Avalanche
18. Storms
19. Environmental and Water pollution
20. Vegetation infestation
21. Drought
22. Thunder
23. Geothermal hazards
24. Karstic subsidence
25. Ground subsidence due to  
mining and exploration
26. Underwater slumping
27. Under water slides
28. Swamp encroachment
29. Floods
30. Volcanoes
31. Fires on coal fields.

## **1. Disaster management**

### **1.1 Strategy and Implementation Mechanism**

In the Government sector the disaster management mechanism is under the overall supervision of the Ministry of Interior. In 1991 the responsibilities and functions related to disasters were formally assigned to the Ministry by virtue of the Budget Act of the same year. The Ministry was mandated to deal with natural disasters which up to that time were discharged by a special disaster task force within the Office of the President. The Ministry was already responsible for the affairs of the non-Iranians residing in the country, including refugee affairs. The new mandate gave the Ministry a pivotal role in disaster management. The police force, gendarmerie and the revolutionary corps were united in the form of the Disciplinary Forces in 1992 and put under the command of the Ministry.

To discharge the assigned disaster management functions, the Ministry formed the Bureau for Research and Coordination of Safety and Reconstruction Affairs (BRCSR).

The BRCSR mandate was quite broad and included research into safety measures, formulation of preparedness and mitigation plans, disaster information collection, analysis and dissemination, provision of coordination services for relief, reconstruction and rehabilitation activities, monitoring activities including coordination of budget forecasting and disbursement and provision of logistical and procurement support services for the provinces.

The BRCSR was also mandated to liaise with international and national centres to utilize their potentials to achieve its given mandate.

The Ministry also formed a National Disaster Task Force (NDTF). As the name suggests the NDTF is a coordinating inter-organizational body whose activities vary during different phases of disasters. When a sudden disaster strikes, the NDTF assumes the major task coordinating relief operations carried out by technical ministries and relief organizations.

At such times, if so required, the NDTF will be directed by the Deputy Minister for coordination of development affairs. At other times the NDTF is mostly concerned with the coordination of research organization. The NDTF is headquartered at the Ministry of Interior in Tehran and relies for its activities on the BRCSR whose director is also the manager for NDTF. A

total of 4550 staff, mostly dealing with administrative and logistic support services perform their duties at national, provincial and local levels.

A plethora of technical ministries and organizations contribute to disaster management in the Islamic Republic of Iran. The role of the Ministry of Housing and Urban Development and its affiliated Housing Foundation is very important as these are the two major organizations for the approval and implementation of special plans, housing projects and building codes including earthquake mandatory codes. The Ministry of Energy, responsible for the management of rivers and dams is also directly involved in studying and applying mitigation measures against the rise of the Caspian Sea. The Ministry of Jihad Construction is mandated to supervise watersheds, forests and rangelands. The Ministry of Health, the Ministry of Roads & Transportation and the Ministry of Agriculture also play substantive roles during the emergency phases. All these Ministries are members of NCNDR and NDTF. The Planning and Budget organization is the supreme approving body for all public sector major development plans, programmes and projects. The MPO also controls the budget and thus has the power to direct investment funds to the management of disasters. MPO is also a member of NCNDR and the NDTF. The Red Crescent Society of the Islamic Republic of Iran, the first of its kind in the region, is by far the most important nongovernmental partner in disaster management in Iran. It is a member of NCNDR and NDTF. In municipalities and in particular the Tehran Municipality, the Mobilization organization commonly known as Basij is another partner in disaster management. Basij was founded as a people's army during the years of war with Iraq in the 1980s. After the war, attempts were made for the Basij to include amongst its functions, the activities of a civil defence organization.

## **1.2 The Iranian Emergency Response System:**

Disasters are categorised as being of national, regional or local significance. Depending on the classification of an event, the respective authorities take control to direct relief efforts. These projects have resulted in a higher level of preparedness in the relevant organizations and therefore better capacity in disaster management, as well as reduction in damages and in number of casualties. In spite of the lack of equipment, experience and human resources specializations, this level of preparedness has increased on a yearly basis.

For instance in rescue and relief, taking into consideration the efforts of the Iranian Red Crescent and simultaneously in health care operations, we are

currently approaching the world standards and in some aspects have already reached this level.

In the field of safety planning, important efforts have been made, one of which is the preparation of the Master Plan for Disaster Management with the aim of rendering cities safe and minimizing financial and human losses in the event of earthquakes. This plan began with the support of Cabinet in the second half of 2000 with collaboration of national experts. The initial destination for the execution of the plan was the capital, Tehran; the most important political, economical and social centre of the country. Furthermore, preliminary steps for the implementation of the plan in the historical city of Isfahan have also begun and the plan will eventually be implemented in provincial centres and major cities across the country.

Moreover for the implementation of the content of article 44 of the law of the third economical, social and cultural development plan of country for disaster management, the national comprehensive plan for rescue and relief in collaboration with the Iranian Red Crescent Society, the Ministry of Interior and the People's Forces (Basij) has been prepared. This plan comprises disaster management, training and safety promotion within communities and improving citizen's preparedness, determining methods for the involvement of participating organizations, the role of media (Seda and Sima), as well as measures and procedures.

The active members of this plan, which has recently been sanctioned by the Ministerial Cabinet, are 11 ministries, member organizations of the National Centre for Disaster Management and national committees, as well as the Army and People's Forces. The hosting organization as well as the chair of this formation is the Ministry of Interior. The National Disaster Centre takes over the responsibility of all organizations involved with disasters.

Furthermore, there is a Council for earthquake vulnerability reduction in the Management and Planning Organization with an active committee with the aim of providing plans for the reinforcement of important public buildings, infrastructures and the main lifelines of the country. In 2002, this Council had a budget of one hundred billion rials (12.500 million dollars) and in 2003, two hundred billion rials (25,000 million dollars); and the studies for the reinforcement plan for Tehran and other provincial centres have began from the second half of the 2003.

Moreover, for the implementation of act "z" of article 16 of the budget law of 2003 and for the purpose of policy making and benefiting from foreign

sources and investment, a loan with the ceiling amount of 300 million dollars has been obtained. This loan is for the improvement of the old urban fabric of the country, namely Tehran, in order to prevent and mitigate damages arising from disasters.

The implementation of provision 181 of the law on the third development plan, mentions that until the end of the period of the plan, 50% of the agricultural and husbandry products, housing and commercial units as well as infrastructure must be covered by insurance. With this aim, in the field of agriculture and husbandry over the past three years, with the financial support of the disaster management centre from the budget for drought which has been paid to the Insurance Fund of Agricultural Products, the rate for insurance has increased by 45% compared to the previous year.

In the field of housing and commercial buildings, the bill for the insurance of commercial and housing structures for disasters has been prepared and is currently being examined by the social commission of the Cabinet.

Parallel to the comprehensive plan of rescue and relief (sanctioned in the meeting dated 6<sup>th</sup> April 2003 of the Ministers Cabinet, referring to article 44 of the third development plan), the Insurance Fund for Agriculture and farming products had to insure until the end of 2003, 50% of the agriculture and farming products and until the end of the year 1388, 100% of these products.

Reconstruction of housing and commercial buildings is carried out in collaboration and with participation of the owners, people's assistance, support of banks and the free technical and engineering services from the government. In this regard, the Housing Foundation of the Islamic Republic of Iran, as a public organization and the government's implementing arm for the construction and reconstruction of damaged houses plays an important role.

### **1.3 National Authorities**

Emergency relief operations in Iran are the responsibility of the Ministry of Interior through the national disaster task force (DTF), whilst emergency relief response across sectors is the responsibility of the appropriate ministries, coordinated by the DTF. If a disaster is classified as being of national significance, the national DTF takes control; if necessary, it

can call upon other government authorities such as the military to assist with relief operations.

#### **1.4 Regional (Provincial) Structure**

The national structure of the Ministry of Interior is mirrored at provincial level. The Governor General and his heads of department comprise the provincial DTF, which coordinates disaster response and relief within the province. If of sufficient magnitude, there is a formal arrangement for neighbouring provinces to respond to assist the affected area. As soon as a disaster occurs, the neighbouring provinces are encouraged to respond as the auxiliary provinces.

#### **1.5 Local (District) Structure:**

Each district in Iran is headed by a governor who again has a number of sub-district governors reporting to him. The district-level DTFs play a key role in managing the immediate search and rescue operation, and the relief phase which follows.

## **2. Iranian National Committee for Natural Disaster Reduction (NCNDR)**

The Islamic Republic of Iran was one of the first countries to set up its national committee through the legislative Branch.

In line with the International Decade For Natural Disaster Reduction (IDNDR), the Islamic Consultative Assembly approved the formation of the National Committee for Natural Disaster Reduction in 1991 headed by the Ministers of Energy, Agriculture, Health, Commerce, Jihad of Construction, Roads, and Transportation and Housing and Urban Development. The Directors of the Planning and Budget Organization, Environment Protection Organization, Meteorology Organization, Forestry and Rangeland Organization, Institute of Geophysics and the Red Crescent Society of Iran are also included. Army and Disciplinary Forces and any other organizations that the Chair of the committee deems appropriate are also able to participate in the Committee. The Committee was designed as a policy making body to provide for the exchange of information and to allow the government to have the authority to support and follow up the related activities. The National Committee has set up 9 specialized sub-committees presided by deputy ministers, 27 provincial Committees presided by General Governors and also a coordination committee presided by the Minister of Interior himself. The 9 specialized sub-Committees (SSC) of NCNDR are as follows:

1. SSC for earthquake and landslides.
2. SSC for vegetation infestation, vegetation diseases and cold.
3. SSC for rangeland revival and coping with drought.
4. SSC for flood prevention, sea level rise and river overflow.
5. SSC for reducing air pollution.
6. SSC for storm and hurricane hazards.
7. SSC for rescue and relief.
8. SSC for loss compensation.
9. SSC for health and medical care.

Proposals received from all the above mentioned SSC are studied and analyzed by the coordination committee to be presented with its final evaluation to NCNDR for decision making.

It is worth mentioning that by virtue of the act on formation of the Iranian NCNDR, it is envisaged that all the activities related to the committee will continue within the decade and beyond. So the elapse of the decade does not apply to the above act as far as the Iranian NCNDR is concerned.

### **3. Accomplishments in disaster Reduction during IDNDR**

The Islamic Republic of Iran in line with the ISDR has undertaken a wide range of activities in order to reduce the effects of Natural Disasters during the decade. The main topics of these activities are listed as follows:

#### ***A: Legislation introduced and enacted in relation with NDR***

1. Act on the formation of National Committee for NDR;
2. Approval of the executive bylaw for the above mentioned act by the cabinet of Ministers;
3. Instructions for particular cases:
  - Technical standards for sand and gravel exploration in river channels;
  - Criteria setting for construction of coastal & intersecting structures, parallel to or over rivers;
  - Consideration of construction limit along river channels and the like.
4. Act on the compensation of damages resulting from floods;
5. Regulation for general directors for NDR;
6. Enactment of building code under standard no. 2800 as an obligatory standard for construction companies and institutions at national level;
7. Regulation concerning the resistance of buildings against earthquakes;
8. Setting instruction documents to be supervised by municipalities and other executive organizations for incorporation of technical and safety measures;
9. Enactment of the Comprehensive Crisis management plan.

#### ***B: Main topics of projects undertaken during the recent years of IDNDR***

1. On average, annually 3000 projects in the infrastructure sector have been executed, amounting to a total of some 32232 projects;

2. Considering the dry and the semi-dry climate of Iran, specially the drought of 1999-2002 and its irrevocable damage to agriculture, farms, orchards and gardens, livestock husbandry, fisheries, natural resources, jungles and meadows, surface water reserves, underground water, dams and flowing water reserves, wild animals and other resources, annually more than 5000 projects and in total 15750 projects in irrigation, water reserves, waste and vaporization mitigation, construction of earth dams, reserve pools, q'anat repairing, irrigation channels, wells, and watersheds, have been executed particularly in provinces with low rainfall;
3. In the sector of damaged housing due to floods and earthquakes, annually an average of 30,000 housing and commercial units and other damaged infrastructure, amounting to a total of 400,000 units were rebuilt and renovated, according to engineering and technical guidelines for earthquake resistant construction and reconstruction;
4. Since 1994, more than 4800 projects for disaster prevention, especially for floods and pests have been implemented in the cities of the country;
5. In addition to the above-mentioned project executed in the last 12 years, in February 2003, 5800 projects for disaster management and 756 projects for disaster prevention were underway;
6. Comprehensive seismic potential and landslide studies in different provinces of the country;
7. Atlas of landslides in each province of the country;
8. Self- assistance training plan against Earthquakes, Risks and Impacts;
9. Cloud seeding plan-coping with drought;
10. Drought and General Guidelines;
11. Research plan on air pollution arising from natural disasters;
12. Project on establishment of disaster databank;
13. Feasibility study on some provinces of the country;
14. Project on reduction of plan frost-bite damages;

15. Climate studies and rural architecture;
16. Completion of seismological and accelerogram networks of the country;
17. Extension of public training and promotion of knowledge of seismology and its related fields;
18. Preparation of a comprehensive model for reconstruction, compatible with different geographical and seasonal conditions present in different parts of the country;
19. Basic studies on flood comprehensive plan for some main rivers in the country;
20. Continuation of a general master plan for flood monitoring and flood prevention;
21. Plans on combating desertification in central and south central parts of the country;
22. Vulnerability and safety studies of building structures;
23. General & specialized Training;
24. Publication of papers, pamphlets, posters, labels, tapes to improve public awareness of disaster mitigation;
25. Cooperation with UNDP in the following areas:
  - Formulating a National Preparedness & Mitigation Plan for Natural Disasters, Project No. (IRA/95/003/A/13/99);
  - Preparation of the comprehensive flood prevention study;
  - Comprehensive seismological study undertaken by UNDP & International Institute of Earthquake Engineering and Seismology (IIEES).

Public Education:

1. Establishing M.A level studies in crisis management with the cooperation of Tehran University;

2. Establishing M.A level studies in seismology with the cooperation of Mashhad University;
3. Conducting short-term courses on River Engineering Projects, Seismic Engineering, Climatological Zoning for Mayors, employees of municipalities and staff of Technical bureau of the provinces;
4. Preparation of Radio & TV programmes for improvement of public awareness.

The following studies have been undertaken to carry out land-use projects:

1. Coordination and concentration of technical potentials present in the country for reconstruction of regions damaged by recent earthquakes;
2. Geological Hazard Potential Reconnaissance Study projects in provinces most liable to earthquakes;
3. Various projects for Land, Flood, Earthquake management in different parts of the country.

***C: Main meetings and Conferences held:***

1. The first international conference of seismology & seismic engineering by hosted by Iranian IIEES- 27<sup>th</sup> -29<sup>th</sup> May 1992;
2. The first international conference on Natural Disaster in urban areas, by Tehran municipality, 11<sup>th</sup> -13<sup>th</sup> May 1991;
3. First Training Workshop for Disaster Management jointly organized by the Ministry of Interior, Ministry of Foreign Affairs, and UNDP, 14<sup>th</sup> - 20<sup>th</sup> September 1992;
4. Conference on Date Evaluation and Earthquake organized by International Institute of Earthquake Engineering & Seismology, 22<sup>nd</sup>- 27<sup>th</sup> November 1992;
5. The first national seminar of Flood Hazard Prevention Techniques, Ministry of Interior, Ministry of Foreign Affairs and ESCAP, Ahwas, Iran, 10<sup>th</sup> -12<sup>th</sup> April 1993;

6. The 8th seminar on Earthquake Prediction by joint cooperation of the Centre for Natural Disasters of Iran, Ministry of Housing & Urban development, Earthquake Prediction Research Group of Berlin (Germany) Ministry of Regional Planning;
7. Regional Training Workshop on Natural Disaster Reduction, case study: Floods and Earthquakes, September 1998- Gilan- Iran, jointly organized by Ministry of Interior and UNESCO.

In addition to above mentioned conferences, seminars and workshops, a number of national and international events were also held in the Islamic Republic of Iran, details of which will be presented in later reports.

***D: Commemoration of the UN International day***

As recommended in the Yokohama Strategy and Plan of Action, and in line with activities taken by IDNDR, Iran has actively participated in the Annual World Disaster Campaign based on each year's theme. The steps taken in this regard have extensively contributed to the enhancement of public awareness which in turn we take as a promising presage for our future efforts to attract public participation in reduction and mitigation of the impacts of natural disasters. In this connection we would like to draw your attention to the following efforts made by NCNDR and 28 Provincial Committees concerning the International Day for Natural Disaster Reduction.

***E: Public awareness***

1. Preparing television and radio programmes during the second week of October every year as the Iranian National Day for Natural Disaster Reduction in order to introduce IDNDR initiative and 9 sub-committees of NDR Committee of Iran on central and local television channels. These programmes include interviews with related ministers and their deputies, the national authorities, provincial authorities, scientists, scholars, specialists, policy-makers, disaster management directors and general governors;
2. Producing various materials about the theme of each year's campaign;
3. Presentation of television and radio programmes on various types of disasters in the country and providing necessary information to the public on ways of disaster reduction;

4. Presentation of short messages about NDR by television and radio as well as newspapers and magazines for public use;
5. Contribution of the country's media and press in reflecting the different aspects of NDs during the second week of October each year as Iranian National Day for NDR to enhance Public Awareness.

### ***F: Painting Competition***

NCNDR has launched a number of painting competitions among children and young adults at country level and similar competitions have been launched by provincial committees and sub-committees in 28 provinces of the country.

### ***G: Publications***

1. Preparation and distribution of posters, pamphlets, books, labels and tapes on public awareness concerning the theme of each year's campaign;
2. Preparing and publishing special issues of Nivar Journal, under the title of, Natural Disaster reduction;
3. Training for children. The publisher is the Iranian Meteorological Organization which also chairs the sub-committee. For counteracting the impacts of storms and climatic disasters (10000 volumes);
4. Preparing and distributing of 15000 posters entitled 'Safety in Schools';
5. Preparation and distribution of 43500 posters on "What to do in the event of an earthquake";
5. Preparation and distribution of 3000 posters on "Taking the Flood Risk seriously";
6. Distribution of 10000 copies of the book "E is for Earthquake" for children from 7 to 12 years old;
7. Preparation and distribution of 200 copies of a book entitled "Behaviour Evaluation of Structures of Ghaenat Earthquake of 10<sup>th</sup> May 1997";

8. Preparation and distribution of a book entitled “Let’s learn together”, published by the Red Crescent Society of the I.R. of Iran;
9. Preparation and distribution of a great number of different posters by 9 SSCs of NCNDR and provincial Committees on different types of disasters conveying messages to warn public of the risks of disasters.

### ***H: Exhibitions***

1. The Institute for Intellectual Development of Children and Young Adults has been a venue for the exhibition of 12000 paintings at country level. A large number of people visited the exhibition hall. One hundred competitors whose works were selected as the best were awarded prizes;
2. Large tableaux (3 by 5 meters) displaying safety recommendations and messages were put up in major squares and public places to provide necessary and concise information for citizens concerning the construction of new buildings;
3. 132 Relief Equipment Exhibitions as well as Workshops were held in public places, parks, and cultural houses and centres for one week. The aim of these exhibitions was to increase public knowledge about Natural Disaster Reduction. The Red Crescent Society of the Islamic Republic of Iran handled these exhibitions;
4. Adjacent to painting exhibition in the Institute for Intellectual Development of Children and Young Adults, another exhibition displaying the activities of 9 NDR Sub-Committees was open. Other SSCs also presented their findings from their research and studies.

#### **4. Activities in Provinces:**

Most of the aforementioned activities in Tehran have been similarly undertaken in the 28 provinces of Iran. Some additional activities were carried out as follows:

1. Local television and radio networks broadcasted special programs on NDR;
2. Friday prayer speakers in their speeches drew the public's attention to NDR;
3. Preparation and distribution of posters and pamphlets on NDR objectives;
4. Provincial press as well as local newspapers published articles and papers on Natural Disaster Reduction Problems during one week.

Owing to the activities mentioned above, damages arising from Natural Disasters mainly from Earthquakes, Floods and Environmental Disasters have been relatively reduced. This is because the public is more aware and now tend to observe the technical regulations, as well as management and city planning standards. It is worth mentioning that the death toll in the country due to NDs in comparison with similar past disasters in some provinces have been reduced to one fifth which can be attributed to people's awareness and the timely issuance of warnings as well as mitigation projects.

## **5. Future requirements for disaster reduction**

According to global estimates, the Islamic Republic of Iran is placed in the list of the top ten countries facing disasters among the developing countries. That is the principle reason why Iran very much welcomed the international initiative to declare the 1990s the international decade for national disaster reduction (IDNDR). Iran found IDNDR to be an opportunity to converge, coordinate and consolidate regional and global strategies. In this regard we can mention the Yokohama Strategy and plan of action which aimed at approaching natural disaster reduction in a comprehensive manner and in the continuance of relief to sustainable development. In recent years, the Iranian national committee for NDR has found its proper place in the community at a time when the implementation of a number of large scale projects, plans and programs were implemented. There is a strong need for ISDR to continue its work in the 21st century. In this process the ISDR secretariat could play an important role to support our national committee for NDR. It should be noted that the act of formation of our NCNDR has not limited the functions of this committee even beyond the decade. We believe that the role of a dynamic successor to IDNDR as a global point within the United Nations will be vital to assist the ongoing activities of NCNDRs in the coming years.

International assistance would be welcomed in following areas:

1. Iran has plans to establish and develop a disaster information system, accordingly it would be vital to have immediate access to information for natural disaster monitoring and management collected by satellites;
2. Accessibility to advanced warning systems in the areas of natural disaster reduction and transfer of technology in these areas;
3. Accessing advanced and successful information and techniques in the areas of early-warning prevention, relief and reconstruction and advanced methods of integration of disaster prevention through educational programmes and financial resources;
4. Establishing a regional network for the exchange of information on natural disasters;
5. There is a need for future international assistance to strengthen the national prevention and preparedness activities in Iran;

6. At the international level, more attention should be paid to the potential risks of environmental emergencies and industrial accidents in Iran which may be caused by natural disasters;
7. There is a need for specialized in-kind contributions, in particular, for items such as heavy-lifting equipment. In other areas, it would be more suitable to receive cash contribution for the local procurement of goods, thus providing a quicker and cost- efficient alternative to in- kind contributions;
8. Prevention and preparedness programs need to be supported and developed in the future, through access to modern technology and training approaches;
9. The UN contingency plan for Iran should be developed, tested and made ready as soon as possible.

## **6. International Cooperation**

The Islamic Republic of Iran is a large country. Due to its climatological and environmental diversity, our country has long been marked as a disaster-prone territory. Moreover, it has been facing man-made disasters, mainly due to the poor political, social and economic stability in its neighbouring countries which in turn lead to future natural disasters caused by natural degradation. During recent decades, our territory has been facing numerous large scale natural disasters. Earthquakes, floods and the rise of Caspian sea level are undoubtedly the major disasters. That is the principle reason why the Islamic Republic of Iran very much welcomed the international initiative to declare the 1990s as the International Decade for Natural Disaster Reduction (IDNDR). Our country was one of the first countries to set up its national committee through the legislative branch. The Islamic Republic of Iran finds ISDR and the world conference a unique opportunity to converge, coordinate and consolidate all national, regional and global strategies to approach natural disaster reduction in a comprehensive manner and in the continuum from relief to development. This is a turning point to foster international cooperation to reduce natural disasters from a global point of view. The members of the international community will find this forum an opportunity to review their national and regional policies and exchange their experiences, especially in the framework of risk management and sustainable development, and its crucial link with natural disaster reduction activities. This is also an exceptional occasion to incorporate natural disaster reduction elements into the development plans and to lay a solid basis to minimize the negative effects of natural disasters, in a systematic manner, especially in the developing world, where natural disasters considerably impede the development process.

Natural Disasters are unfortunate and destructive in all forms. All nations try to reduce their impact, but unfortunately not all nations possess the adequate possibilities to do so. This is mainly due to underdevelopment which exacerbates a general weakness in the face of natural disasters. And when the international community has been mobilized for the improving of ISDR in a global context, the fundamental issue to be addressed here would be how to combat underdevelopment- the major challenge of our age. There is a direct clear-cut connection between the level of development and vulnerability in the face of natural disasters.

We believe that real international cooperation in the field of Natural Disasters would be assisting countries to develop early warning systems, preventive measures, relief and post-disaster reconstruction activities. The

World Conference on Natural Disaster Reduction is the lucid indication of political will at international level, to approach natural disasters in a comprehensive manner and from relief to development.

We believe that if international cooperation for natural disaster is to be dynamic, effective and productive it should be on the following areas:

1. Natural disasters are most destructive in developing countries, where the infrastructures are fragile and vulnerable and the resources to strengthen them are impoverished and scarce. Underdevelopment increases vulnerability to natural disasters. This is the underlying fact when we are discussing any natural disaster reduction strategy. The existing financial resources and particularly the Trust Fund, if that originates from this Conference, would be best utilized when used to advance the National development plans and to incorporate the Natural Disaster reduction strategies into National development plans. In this regard it is a matter of priority that the disaster prone countries in the developing world be provided with the necessary financial and technical resources to strengthen their natural disaster prevention capacities. This is the basis of a solid policy;
2. Natural Disaster reduction should be approached in the continuum from relief to development, otherwise we will waste our resources coping with repeating disasters;
3. It is the right of all Nations to have access to the information collected through technically advanced means, especially satellites, which open new revolutionary prospects to natural disaster management. This access should be easy, rapid and indiscriminate in order to be integrated into effective measures;
4. The existing mechanisms for information sharing, formulation and implementation of Natural Disaster programmes at the regional level are not quite as complementary and integral as they should be. Since Natural Disasters are not usually limited to political borders, preventive measures should also be approached from a regional point of view in order to guarantee efficiency and sustainability;
5. There is an urgent need to establish regular, practical and efficient information sharing mechanisms among neighbouring countries for natural disaster reduction. This practice would lead to more efficient preventive measures;

6. The crucial interrelationship between natural disasters and environment degradation should be further emphasized and deliberated. This interrelationship entails the renewed attention of both disaster and environmental policy makers in a coordinated manner and at the national, regional and international level;
7. The other important related issue is the negative impacts of refugee and displaced flow on the environment that often leads to natural disasters caused by the overuse of natural resources in certain areas. This is particularly the case especially when the presence of refugee and displaced people is unexpected and concentrated;
8. The particular and complicated difficulties of metropolises means that the necessary deliberations, preparations and preparedness plans are essential in order to minimize the vulnerability of millions of people living in urban areas in the case of natural disasters;
9. The goal of strengthening national, regional and global cooperation for natural disaster reduction needs more organized working relations among National committees, OCHA and UN organizations which could be developed into a permanent mechanism for information and expertise exchange if provided with the necessary international funding;
10. Strengthening the existing capacity to react to Natural Disasters, speedily and efficiently, could be considerably improved through the setting up of stand-by and regional warehouses of UN OCHA in different parts of the world to achieve good global coverage;

The Islamic Republic of Iran as a disaster-prone country has had much practical experience in the fields of analysis, relief, prevention, rehabilitation and reconstruction activities. Moreover, the International Institute for Seismology and Earthquake Engineering (IISEE) is now functioning as the regional centre for seismological analysis and risk assessment studies. This is a very solid basis upon which we extend our cooperation in terms of earthquake analysis and risks to all countries in the region and especially the CIS countries. International cooperation at its various levels is the key to minimizing the vulnerability of our region, continent and planet when faced with natural disasters.

**7. The overall Strategy of the Ministry of Interior regarding disaster management in the fourth plan for economical, social and cultural development.**

1. Enforcing reinforcement policies of infrastructures and industrial sites against earthquakes;
2. Flood mitigation measures in rural and urban areas;
3. Reinforcement of strategic buildings by allocating funds and services;
4. Providing the necessary arrangements to clear riverbeds and limits to execute river engineering plans in order to protect adjacent infrastructures and those further down river;
5. Preparing and executing plans for centres to store relief stock and equipment in secure areas close to provincial centres and major cities of the country;
6. Comprehensive plan for organizing rescue and relief network and promoting safety and self-relief in the framework of public training and expansion of the specialized training for rescue and relief;
7. Capacity evaluation of national, provincial and township to support rescue and relief operations by the means of performing feasibility studies;
8. Preparation of housing models suitable to various climate and seismic conditions of the country in collaboration with scientific and research institutes;
9. Securing tourist and recreational areas within and outside the city limits;
10. Preparation and execution of multi-purpose (economical, job creation, and disaster risk mitigation) projects;
11. Balancing between husbandry and meadow of the country according to the law of the third development plan;
12. Transforming fields with low output to meadows, grass fields and orchards;

13. Implementation of “National action plan for deserts and reduction of drought effects” in collaboration with the relevant organizations;
14. Qualitative and quantitative development of forests outside of the north with the aim of preservation of earth and water and balancing the ecosystem;
15. Provision of the necessary equipment and training to prevent forest and meadow fire, as well as training;
16. Improving and equipping meteorological equipment and early warning systems for floods, and communication within the country;
17. Expansion of the road network and making best use of data and information in order to mitigate the effects of climate related disasters;
18. Providing provincial structures suitable for information sharing and rapid warning;
19. Preparation and implementation of projects related to air, water and environmental pollution;
20. Preparation and implementation of projects related to human and industrial sewage and expansion of local health plans;
21. Preparation of a comprehensive plan to mitigate the effects of drought;
22. Protection of water resources of the country and implementing projects to make the best use of water and prevention of water waste throughout the country;
23. Earth resources protection and implementing projects to prevent disappearance of agricultural earth;
24. Foreseeing the necessary means to provide fuel to nomadic and forest region in order to prevent cutting of trees that on the way of floods.;
25. Implementing policies for the expansion of insurance in the fields of agriculture, housing, commercial and industrial buildings;

26. Expansion of insurance schemes regarding natural resources (plan for fields, management of jungles, multi-purpose forestation, deserts aforestation, etc.);
27. Renovation of scattered villages and improving the condition of Kurd and mud (acrobat) houses;
28. Implementing projects to unify, selecting a cultivation model and the repairing of traditional irrigation systems;
29. Allocating 50% of the budget of the Centre for disaster management to disaster risk mitigation projects;
30. Improving the conditions of settlements and renovation of the old urban fabric;
31. Performing seismic studies of trembles and geotechnical trembles and landslides in smaller cities;
32. Provision of required laws and guidelines with regard to the low financial status;
33. Preparing the ground for investments, participation and community collaboration in disaster risk management;
34. Supervision for proper implementation.

## **8. Earthquake risk reduction council**

The strengthening of buildings, infrastructures and lifeline facilities are very important for responding earthquake risk reduction and natural disasters.

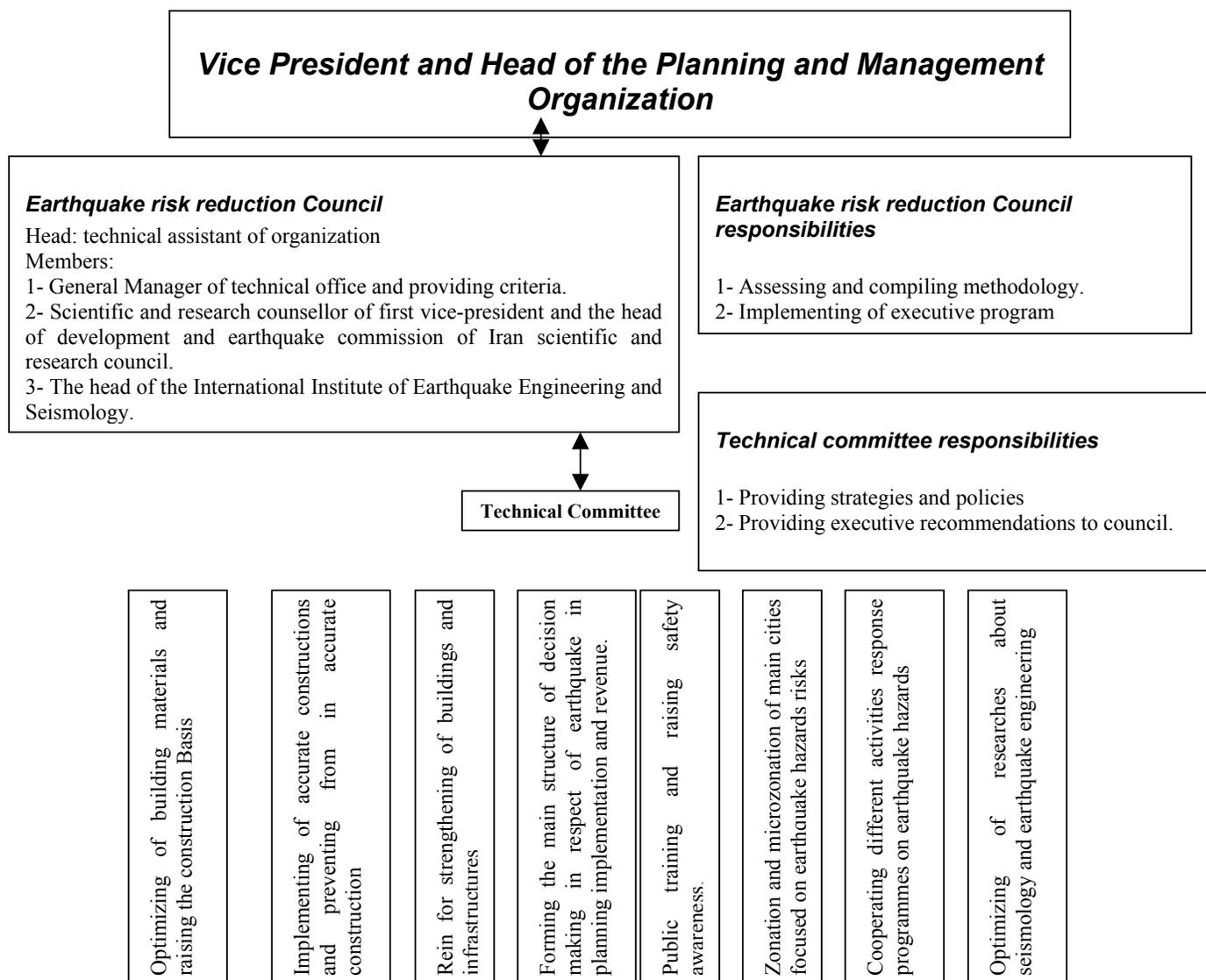
The strengthening process is composed of many factors. These factors are various and important. Some of them are as follows:

1. Study and research about vulnerability;
2. Renovation, reconstruction and retrofitting of buildings, infrastructures and lifelines based on national and international regulation, standards and codes;
3. Executive and necessary maps and implementing them;
4. Providing building materials and optimizing based on recent standards.

As mentioned above, infrastructures and lifeline facilities are very necessary for people and play a key role in their life. Water supply, electric power and fuel are the primary requirement when, natural disasters, especially earthquakes occur.

The dimensions of disasters on infrastructures, lifelines and the community are dependent on many factors such as, seismic risk levels, degree of vulnerability, relief operations and socio-economic conditions.

To analyze the different dimensions of disasters and reducing their impact, the Earthquake Risk Reduction Council has been established. The schematic role and activities of this council is shown under the following flow chart:



### Executed Operations and Activities

1. Providing seismic assessments Guidelines for buildings;
2. Providing rehabilitation assessments Guidelines;
3. Providing details of executive strengthening of buildings;
4. Analyzing advisors remuneration fees for seismic assessment and strengthening plans;
5. Illustration of seismic rehabilitation of existing buildings;

6. Establishing data bank and internet sites;
7. Implementing of public training and education such as films, training billboards;

Strengthening projects

1. Studying and strengthening of relief centres;
2. Studying and strengthening the main bridges and roads of Tehran;
3. Studying and strengthening of the main centres of the Ministry of Interior;
4. Studying and strengthening of media buildings;
5. Studying and strengthening of strategic buildings;
6. Studying and strengthening of the main building of the Ministry of Defence;
7. Studying and strengthening of all schools;
8. Studying and strengthening of hospitals;
9. Studying and strengthening of the main training and education centres;
10. Studying and strengthening of the water supply;
11. Studying and strengthening of electric networks;
12. Studying and strengthening of Tehran refinery;
13. Studying and strengthening of relief pressure stations;
14. Studying and strengthening of risers (main Gas pipe) of Tehran city;
15. Studying and strengthening of Gas stations;
16. Studying and strengthening of installation of south Oily region;
17. Studying and strengthening of operation and Gas installation;

18. Studying and strengthening of the central building of the Ministry of Petroleum;
19. Studying and strengthening of the main petrochemical installation;
20. Studying and strengthening of the main rail roads;
21. Studying and strengthening of the Ministry of Information and Communication Technology;
22. Studying and strengthening of the main communication company of Iran;
23. Studying and strengthening of communication operations centres;
24. Studying and strengthening of Iran communication operations.

# Chapter 2

## **Earthquakes and Landslides Working Group**

### **1. A Review of the Earthquake and Landslides Situation in the Islamic Republic of Iran**

#### **1.1 Introduction: A summary of structural situation and the background of Seismicity in Iran**

The Islamic Republic of Iran is located in the area of the mountain belt of Alp-Himalayas, which is the last and the youngest mountainous area in the world; therefore, the mutation phenomenon are revealed in it in different forms. The spreading of the Red Sea resulting in the movement of the Saudi Arabian desert towards Iran, the displacement of the Indian Ocean bed in the Oman region towards the northeast, and the movement of other lithosphere plates around Iran have caused circumstances that lead to disastrous earthquakes in Iran every so often, due to the release of energy produced by concentration of stresses in the direction of faults. Iran has a long history of earthquakes. In addition to more than 160000 casualties in the last 90 years in various regions of the country, psycho-social impacts and great financial losses have also been caused due to the destruction of cities like Ray (Tehran), Tabriz, Roodbar, Mangeel and Tabas. Furthermore, by reviewing the past data, we will find that no area of this territory has been impervious to earthquake waves. Due to significant population growth and the inevitable continuity of this natural phenomena, the danger of earthquakes has also increased. In addition to the direct destroying effect of the earthquake, other induced effects such as liquefaction and landslides also threaten our country.

#### **1.2 The seismicity and earth structure of provinces of the Islamic Republic of Iran**

Since the location and situation of faults of an area and the characteristics of the earthquake in that region can define the earth structure of the region, the most important classification of earth structure according to earthquakes is introduced as follows:

- Barbarian classification 1976

- Noroozi classification 1976
- Nogol Sadat classification 1993
- Pour Kermani and Assadi classification 1995
- Padir Tehran consultancy engineers classification 1996

### **1.3 Actions in the Field of Earthquakes and Landslides**

In order to reduce the effects of natural disasters and according to provision 5, single clause of law, forming the national committee for reduction effects of natural disasters, sanctioned in Islamic council in 1991, and according to article A, Act 1, the decision of the meeting dated 2<sup>nd</sup> May 1993 of the Ministers Cabinet, the Sub-Committee for Confronting Dangers Caused by Earthquake and Landslide, under the responsibility of the Ministry of Urban and Housing, was formed as a branch of the National Committee for Reducing the Effects of Natural Disasters. The members of this sub-committee comprise the Housing Foundation, Iran's Atomic Energy Organization, the Organization of Environment Protection, the Geology Organization, the Islamic Republic of Iran Seda and Sima, Tehran Municipality, the Housing and Building Research Center, International Institute for Seismology and Earthquake Engineering, Tehran University's Geophysics Institute, Ministry of Jihad Construction, Ministry of Roads and Transportation, Ministry of Culture and Higher Education, Ministry of Interior and Ministry of Housing and Urban Planning.

Meanwhile according to provision 1 of article 35 of the decision of the Ministers Cabinet dated 12<sup>th</sup> April 2003 (the comprehensive plan for rescue and relief), the "Sub-expertise committee for confronting dangers caused by earthquake and landslides", has been changed to the "Earthquake and landslide expertise group".

### **1.4 The Danger Assessment of Earthquakes and Landslides**

In order to identify the dangers of earthquake and landslides, the Earthquake and landslide expertise group has performed the following projects:

1. The assessment of the slide potential using small Micromovement;
2. Comprehensive reviewing of Landslide danger in Gillan province;
3. Providing a database system for the country's landslides;
4. The landslides caused by earthquake in Iran: first stage Alborz;
5. Providing the optimal micro-zoning map of landslide risks in Damavand Cachtment area;
6. Micro-zoning of earth layers;
7. The comprehensive research plan required for preventing the occurrence or reducing the losses caused by landslides in Iran;
8. Providing the dispersion plan of the old landslides using aerial photos with the scale of 1:20000;
9. Research of the micro-zoning of landslides of Gilan province with the scale of 1:20000 for landslide potential area over 50%;
10. The zoning of landslide risks in catastrophic areas (central Alborz);
11. The zoning of landslide risks in Semnan with the scale of 1:5000;
12. The zoning of landslide risks in Chahar Mahal va Bakhtiyari;
13. The zoning of landslide risks using GIS in Ahar Chai in east Azerbaijan area;
14. The topographic behaviour effect against earthquake in some cities adjacent to the mountain;
15. The detailed micro-zoning of earthquake risks of Tabriz;
16. Examining the earth structure and earthquake risk of the fault in Mashhad;
17. Studies of earth structure and analysis of active faults;

18. Identifying the fault trade of Dorood in alluvial regions;
19. Studying the earthquake risk in Khoorasan;
20. Studying the seismic and earthquake structure in northwest of Iran;
21. Studying seismic of Boeein Zahra region;
22. Studying the Seismotectonics of Nahavand fault;
23. The structure of earthquake and the mutation geometry of central-eastern Alborz by reviewing the range that have a higher level of seismic;
24. The earthquake danger of the fault in east Azarbayejan by reviewing the local faults of Tabriz range

### **1.5 The Vulnerability Assessment of Existing Buildings against Earthquake and Landslides**

This working group has begun to evaluate the vulnerability of existing buildings to earthquakes in different provinces of the country. At present, the results of these studies are being collected in the form of a practical project entitled “Qualitative assessment of urban buildings in different regions of the country”.

### **1.6 Reinforcing the Existing Buildings against Earthquakes and Landslides**

In the area of reinforcing the present buildings, this working group has started the following projects:

1. Providing technical ID for buildings;
2. Evaluating various types of rural structures and rural building regulations;
3. Technical guidelines for reinforcing steel buildings;
4. Pictorial instructions for standard masonry buildings with earthquake safety aims;

5. The guidelines for using the new Regulation 2800;
6. Empirical study of reinforcing methods of masonry buildings and semi-skeleton against earthquake with the least amount of destruction and their comparison for technical-economical optimization;
7. Providing regulations for special structures;
8. Earthquake vulnerability of concrete structures with filling walls;
9. Presenting a method for determining the seismic vulnerability of bridges;
10. Evaluation of resistance and form flexibility of existing buildings against earthquakes;
11. Theoretical and laboratory research on unarmed brick buildings behaviour according to the instructions of regulation 2800;
12. Evaluating various types of rural structures of Booshehr;
13. Evaluation of reconstructed regions in recent earthquakes and presenting procedures to improve structural quality (procurement department);
14. Evaluation of reconstructed regions in recent earthquakes and presenting procedures to improve the structural quality (location department);
15. Quality evaluation of urban buildings of different regions of the country;
16. Regulation guidelines for the buildings reinforcement against earthquake plan;
17. Providing the draft for safety regulation of building vibration;
18. Technical guideline plan for reinforcing concrete buildings;
19. Technical guideline plan for reinforcing masonry buildings;
20. The method of constructing and operating the materials for rural

- construction authorities;
21. Structural and unstructured application of the materials and products for light and semi light buildings according to the facilities and climate conditions of the country.

### **1.7 Improving the Safety Culture of the Society against Earthquakes and Landslides**

In this area the following actions have been carried out:

1. Providing expertise and public training in the form of films, books, papers, pamphlets, brochures, security warnings, television programs;
2. Producing expertise- training video films (1);
3. Producing expertise- training video films (2);
4. Producing 20 short training films, each for 2 minutes;
5. Training programs for prevention of human activities which cause or intensify earthquakes;
6. Training plan for self-relief and cooperation to predict and deal with earthquakes and the loss caused by them;
7. Producing a training film about pictorial instructions for standard rural and urban masonry buildings;
8. Training with animations (Producing short films in the form of computerized animations);
9. Learn together (Making a 5 part film collection with training messages);
10. Providing training posters for unstructured items;
11. Providing street posters for preparing against earthquake;
12. Providing training programs for lightening the buildings;
13. Providing the syllabus for training-improving classes for rural people and performing some experimental classes;

14. Studying fires caused by the earthquakes in the world and providing guidelines for protecting buildings from fire and probable damage caused by earthquakes;
15. Making documentary film for rural people and public (human actions that cause earthquakes and the way to prevent them or minimize their effect);
16. Making documentary film for experts (human actions that cause landslides);
17. Training courses for the senior managers to decrease the dangers caused by earthquakes. These training courses are also available on film;
18. Making training film of earthquake and security for the state employees;
19. Providing training materials (labels) to place inside the public transportation systems;
20. Codification of public training in the factories;
21. Evaluation of social-economical effects of recent earthquakes in rural society;
22. A television serial about dealing with the dangers of earthquakes and reducing the destructive effects entitled “safety against earthquakes”;
23. Training programs in the area of earthquake safety;
24. Providing training pamphlets “How to build our houses according to the standards and resistant to earthquakes?” for art schools;
25. Television serial about urban crisis management in the event of an earthquake;
26. Public training about urban crisis management against earthquakes for people who live in Tehran;
27. Supporting the related scientific conferences;

28. Holding an annual reducing natural disaster week in the form of exhibitions about scientific-research outcomes for earthquake and landslides department and scientific-expertise lectures, at the anniversary of decreasing the effects of natural disasters on 11<sup>th</sup> October. The national committee for decreasing the effects of natural disasters organizes a week long event.

### **1.8 Important actions that have resulted in guidelines:**

1. Database of the country's landslides;
2. Publishing the zoning map for relative risk of earthquakes in Iran;
3. Providing the building technical ID;
4. Evaluating various types of rural structures and rural building regulations;
5. Technical guidelines for reinforcing steel structures;
6. Codifying the evaluation procedure for building vulnerability;
7. Reducing risks in Tehran;
8. A description on edition 2 of Regulations 2800;
9. Evaluation of reconstructed regions in recent earthquakes and presenting ways to improve the construction quality;
10. Qualitative evaluation of urban buildings in different regions of the country;
11. The earthquake insurance project and the construction responsibility insurance according to the developed methods of insurance culture in Iran;
12. Training program for prevention of human activities that cause or intensify landslides;
13. Training film about masonry building instructions according to the urban and rural standards;

14. Street posters for preparation against earthquakes;
15. Training posters for unstructured items.

### **1.9. Obstacles**

#### ***A: Structure and lifeline infrastructures***

1. The buildings, whether rural or urban: A large amount of research has been carried out in this area. It is necessary that the related research leads to administrative procedures;
2. The lifeline infrastructures: No considerable research has been done in this area. It is necessary to do some applicable research concerning the importance of different infrastructures such as telephone, power, gas, water supply, wastewater and roads;
3. Emergency residences;
4. Temporary residences as a part of permanent residences. Special attention must be paid to this issue;
5. Permanent residence;
6. The important and particular structures: structures such as dams, bridges, power stations and public buildings like hospitals, and security centres particularly the crisis room, are the other areas where a fixed procedure is required;
7. Providing fast evaluation methods for buildings security after earthquakes and classifying them;
8. Repairing methods: after natural disasters it is necessary to apply proper repairing methods for damaged buildings. It is also important to consider the material used, speed of work and the methods.

#### ***B. Earthquakes and seismotectonics***

1. Study and survey of seismic and earthquake structure of seismically active regions of Iran: some studies have been performed in this area in the past. But it is necessary to present some modern analysis according to the new information in different areas. Undoubtedly, these must take

into account the vastness of Iran, priorities such as population density, social problems, fundamental investment and economical problems among others;

2. Study the detailed seismic microzoning in big cities: microzoning is one of the most important studies for identifying the seismic nature of some cities or strategic regions. In this case all the available data must be used;
3. Local studies of active faults leading to earthquakes: as most fundamental, active and earthquake faults (particularly the underlying faults) are not identified properly, it is necessary to study them. In this case the important earthquake faults have to be studied with proper measurement under the coverage of tectonic and if necessary under the seismographic networks, in order to identify the activate nature of these faults and their spread around them. In the case of identifying underlying faults, it is necessary to carefully consider their morphotechnical study;
4. Study and measurement of crust deformation according to geodetic surveying and satellite (GPS) procedures: to become aware of the probable movement of the crust and therefore the fault leads to earthquake behaviour, it is necessary to cover some regions continuously. In this case we can use the geodetic surveying for small regions, and satellite procedures for big regions;
5. Determining the crust model in different regions of the country: in many parts of the country, we do not know the thickness and speed of earthquake waves and therefore deep surveys about earthquakes have been faced with problems. It is necessary to carry out the necessary studies using all earthquake data in order to identify the speed model of the crust;
6. Archeo seismology: as the movement and slide of the active faults at the time of the ancient earthquake events is not obvious and for most regions such as deserts and isolated regions, the history of ancient earthquakes has not been identified, it is necessary to use old research about earthquakes in order to identify the correct data;
7. Presenting the earthquake designated spectrum for different geological conditions in the country.

### ***C. Geotechnic and landslides***

1. The regional earthquake risk for critical regions: Providing maps for the regional zoning risk for critical regions for programming and proper exploitation of lands, is a tool for preventing and decreasing the damages caused by this phenomenon. So it is recommended to provide these maps with proper scale and use the effective parameters of preventing earthquakes and choose the desired methods by applying geographical data software such as GIS;
2. Study the different methods of measuring the earth behaviour in landslides and identify the proper procedure for Iran associated with case study, behaviour of the earth and continuous control of the slope susceptible to slides, particularly in the regions adjacent to vital roads and residential areas, to control or minimize the damages is very important. So using this procedure through previous experiences, practical identifying of proper and authentic methods, designing, constructing and using measurement tools and recording data and providing analytical software for warning is concerned and emphasized;
3. Providing the geotechnical map of earthquake in major cities: for identifying the earthquake dangers and geotechnical unsteadiness caused by it, it is necessary to study different regions. So identifying geotechnical parameters of the earth through the earthquake, such as earth cross-section resistance, earth-structure interaction and studying different methods for measuring the resistance, identifying the susceptible regions of falls and sediments, risk analysis and the evaluation methods for identifying these dangers is required according to which different regions are regionalized;
4. Providing engineering and geotechnical ecosystem maps of endangered cities: knowledge of eco-engineering characteristics to choose the proper structure has an important effect in decreasing the time of projects, administrative expenses and minimizing problems during and after construction. So providing engineering ecological maps to determine the conditions and engineering and geotechnical maps of earth in big cities is concerned and required;
5. Completing the landslides-dispersing map of different regions of the country.

***D. Public and expertise training:***

1. Using the public media (audio, video, writing) for preparation against earthquake and landslides;
2. Providing and codification of training programs and materials to improve know-how of rural and urban construction authorities;
3. Methods to use public cooperation to decrease the dangers caused by earthquakes and landslides;
4. Codification of training programs to improve the knowledge of managers and authorities for minimizing the damage caused by earthquakes and landslides;
5. Security manoeuvres: experiences, problems and procedures;
6. Codification of procedures to improve public awareness through increasing the use of modern technology;
7. Regulating the instructions and providing training films for rescue, search and assistance team after earthquakes;

***E. Providing and improving database:***

It is the most essential to have a database for research. So providing required database, which has not been created up to now, and improving the present database along with designing and using proper software and their maintenance is very necessary to reduce the damages caused by earthquakes and landslides. Providing and reviewing databases, their completion and development using different software and more complete questionnaires for research and management programs needs to be carefully considered.

**1.10 The best action**

One of the most serious and terrible earthquakes in Iran was the Bam earthquake, which is mentioned below as a case study:

Case study No. 1 of Bam earthquake

The Bam earthquake with a magnitude of 5.6 on the Richter scale, occurred at 5:26 a.m. on 26<sup>th</sup> December 2003 in southeast Iran and caused

considerable human and financial loss in this region. According to official statistics, more than 30000 people were killed and more than 80% of Bam was ruined. It also caused considerable and fundamental loss to lifeline infrastructures: water supply network, the subterranean power network, health care centres, schools and high education and culture centres, cultural heritage particularly the historical complex of Bam Arg, industries, cooling plants and orange and date orchards.

The geotechnical properties of this destructive earthquake are earth surface rupture, hillside slides in valleys and canals walls, earth surface sink, fall of the subterranean and under earth hole walls in the region, breaking and bending the power poles, breaking the water pipe joints and destroying structures.

The origin of the earthquake was Bam fault and this fault is located east of Bam and west of Baravat. Its mechanism is synstral straightforward fall. The research carried out by Iran Natural Disasters Research Centre and Kioshu University in Japan showed that this fault is a new fault underlying the bed of Bam. Its identification was possible following analysis of the focal spot of about 200,000 after-shocks which occurred in the region after the main earthquake.

Other actions are:

- Holding technical consultation workshops on Bam Reconstruction with collaboration UNDP- NDRII;
- Assessment and estimation of damages to Bam by the earthquake;
- Correction and codification of the projects related to reconstruction of Bam;
- Providing the required comprehensive research plan for Bam reconstruction by the earthquakes and landslides working group;
- Studying and providing the risk regions maps in Iran;
- Providing and codification of a comprehensive plan for Disaster management in the provinces;
- Establishing and starting up crisis rooms in the provinces;
- Providing and codification of programs and related research to decrease natural disasters effects and to achieve the permanent development in the fourth development program in the country and UNDAF;
- Establishment of the Bam reconstruction strategic staff to provide reconstruction program of Bam and its required actions.

## **2. IIEES, Mission and Achievements**

The International Institute of Earthquake Engineering and Seismology (IIEES) is a comprehensive international research institute in the field of earthquakes that was established in Iran based on the 24<sup>th</sup> UNESCO General Conference Resolution DR/250 and the Iranian government approval in 1989. It is an independent institute under Iran's Ministry of Science, Research and Technology. The main goal of IIEES is seismic risk reduction and mitigation both in Iran and the region by promoting research and education in science and technology related to seismotectonic, seismology and earthquake engineering. IIEES activity in research covers all aspects of the earthquake from tectonic study to retrofitting complex structure; and in education from public education to PhD program in earthquake engineering. IIEES is composed of following divisions: Seismology, Geotechnical Earthquake Engineering, Structural Earthquake Engineering, Risk Management, Graduate School, Public Education and Information.

### **IIEES action plan is as follows:**

1. Seismotectonic and seismological research on the earth crust, active faults, seismic and earthquake hazards; mapping active faults, hazard zonation; and earthquake catalogues;
2. Developing and expanding the Iranian National Seismic Network and mobile seismic networks for a better understanding of seismic activity, and providing online post event information to the disaster management authorities;
3. Conducting comprehensive theoretical and experimental researches in the fields of liquefaction, landslides, site effects, soil structure interaction, soil modelling, dynamic behaviour of porous media, earth-structures behaviour, zonation and geotechnical microzonation;
4. Conducting comprehensive analytical, experimental, field and instrumental studies and research for seismic safety of structures (buildings, lifelines, industrial structures, power plants, oil and petrochemical industries, and important facilities like dams and bridges);
5. Developing seismic design methods, guidelines and codes for new buildings, strengthening existing structures; as well as adopting new technology for semi-industrial construction of buildings against earthquakes;

6. Vulnerability and risk assessment of cities, developing integrated, doable and effective risk management and reduction program, proposing effective risk reduction measures to the authorities, and cooperate toward its approval and implementation with the consideration of socio-economic and cultural aspects of the country;
7. Promoting earthquake safety, prevention and preparedness culture in all levels of society (general public, specialist and decision makers) through comprehensive earthquake awareness programs;
8. Education and training by offering M.S. and PhD graduate program and specialized courses to transfer the technical know-how for experts and engineers; and by using all type of media and means to disseminate the research results, knowledge and information to all;
9. Providing technical and research consultancy to the government and industries for their seismically safe development and construction;
10. Expanding scientific and technical cooperation and exchange of knowledge with the international and regional organizations and institutions in all the fields related to earthquake risk reduction and mitigation according to the general rules of the country.

Over the past 14 years IIEES has made a major contribution towards the development and implementation of the earthquake risk reduction program in Iran as well as in the decision making process and promoting the safety culture and public awareness.

The recent contributions and accomplishments in various fields of IIEES activities are:

***Seismotectonic:***

1. Development of major active faults map of Iran (scale 1:1,000,000) and of Tehran (scale 1:100,000);
2. Paleoseismological study of Tabriz, Eshtehard, Kahrizak and Mosha active faults for more accurate hazard assessment of cities of Tabriz and Tehran;

3. Investigation of active tectonic of Alborz, Zagros and the transitional zone between Zagros and Makran;
4. Detailed study of the site of petrochemical city (Asaluyeh) in south of Iran.

***Seismology:***

1. Installation and maintenance of Broadband National Seismic Network;
2. Seismic catalogue of Iran (Historical and 1900-Present);
3. Global and local GPS measurement in Iran for measuring the continental deformations;
4. Long passive seismic monitoring across Zagros Belt (Busheher to Yazd), Aloorz, Makran, South-North, Zagros-Alborz, etc. for crustal and upper mantle structural definitions and investigation of subduction zone.

***Seismic Hazard Analysis:***

1. Processing and detailed analysis of the strong motion data recorded in Iran (1975-2000);
2. Development of PGA and spectral value attenuation relationship for Iran;
3. Development of detail seismic hazard zoning map of Tehran.

***Geotechnic:***

1. Expansion of the soil dynamic testing facilities;
2. Development of site effect microzonation map of Tehran by using analytical, experimental and microtremor methods. The map includes natural site period, dynamic site period, PGA distribution and design spectrum;
3. Comprehensive study on the liquefaction potential assessment of Tehran alluvium has been done and based on historical data, geological, geomorphological and hydrogeological condition, the

preliminary liquefaction potential microzonation map has been prepared;

4. Extending site effect, liquefaction and landslide microzonation studies to cover all part of Tehran;
5. Geotechnical hazard microzonation of various provinces and industrial cities;
6. Quantification of topographical effects on free field motions, using numerical and experimental methods;
7. Study on monotonic and cyclic behaviour of compacted composite clays;
8. Ambient and forced vibration studies on two embankment dams;
9. Providing guidelines for seismic design of soil structures.

***Building Structures:***

1. Development of advanced structural laboratory with shaking table for static, quasi-static and dynamic testing;
2. Increasing technical knowledge on vulnerability assessments;
3. Development of Seismic vulnerability functions for typical Iranian buildings;
4. Development of guidelines for vulnerability assessment of common building types (masonry, concrete and steel structures);
5. Performing pilot projects for various types of buildings such as: hospitals, fire stations, schools, housing apartments and office buildings to show the applicability of the vulnerability reduction;
6. Providing strengthening schemes for typical Iranian steel structures;
7. Study of the seismic vulnerability of the mega city of Tehran;
8. Development of a joint plan with Iran's Cultural Heritage Organization for the protection of historical buildings against earthquakes;

9. Economical study on different aspects of earthquake resisting structures;
10. Upgrading the technical knowledge of engineers through training programs and publication on aseismic design and construction;
11. Helping authorities to develop a work plan for vulnerability analysis of their facilities;
12. Establishing an authority in this field in Iran.

***Lifeline and Special Structures:***

1. General studies concerning all lifeline systems, dealing with matters like needs and know-how, lifelines interactions, and urban design;
2. Vulnerability assessment of Tehran Water system;
3. Development of guidelines for seismic design of gas network;
4. Forced vibration analysis of typical bridges, offshore structures, and concrete dams;
5. Development of the technical capacity for vulnerability assessment of oil and chemical facilities;
6. Performing vulnerability assessment of oil refineries and petrochemical plants;
7. Establishing an awareness program for the oil and chemical industry.

***Graduate Studies:***

In 1990, IIEES started the postgraduate studies program with the purpose of developing the science and technology skills related to earthquake and also educating engineers by performing short technical courses and admitting students leading to M.S. and PhD degrees. The program aims at:

1. Technological advancement of civil engineers and those people who are involved in construction for the design and building of safe structures against earthquakes;

2. Educating the involved sectors to fulfil the technical and engineering needs by setting up courses as will be explained later.

***Public Education and Awareness:***

1. Increasing public awareness of earthquake hazards and preparedness by communicating with the general public through all types of media;
2. Educating children and youngsters about earthquake preparedness at both elementary and high school levels by including materials in textbooks, showing films, conducting drill, painting and writing competitions and exhibitions;
3. Organizing the annual national “Earthquake and Safety” drill in more than 110,000 primary, secondary and high schools with participation of more than 16 million students on 28<sup>th</sup> November since 1998;
4. Organizing bi-annual Asian painting as well as annual arts and craft exhibition on seismic safety in second week of October;
5. Strengthening the key role of women in hazard mitigation program and promotion of seismic safety culture;
6. Designing and posting street posters that teaches the basic point of seismically safe buildings;
7. Organizing Earthquake Safety Exercise in kindergartens in Tehran annually in May since 2000.

***International Cooperation:***

1. Performing joint research with universities and research institutions in France, Armenia, Japan, Russia, Italy, Norway, China, England, and Germany among others;
2. Active cooperation with UNESCO, UNDP, CTBTO, UNEP, EMI, ISDR, ICTP, TWAS and many other international and scientific associations;
3. An open Alliance of UNESCO/UNDP/ISDR/IIIES for earthquake risk reduction - The Bam earthquake presents an opportunity to make the best use of the existing know-how on earthquakes. It also compels the

scientific and engineering community to provide more socio-economic and culturally compatible solutions to national development needs. Moreover, the public at large needs to become more aware and concerned about vulnerability to hazards. To facilitate discussion in this regard, UNESCO, UNDP, UN/ISDR Secretariat and the IIEES (as the host institute in Iran) have agreed to form an Alliance which will be open to a wider partnership among both Iranian and international institutions and organizations. The objective will be to initiate a series of activities to protect people, building stock, lifelines and critical infrastructure from the impacts of future earthquakes. The Alliance will advocate a shift in emphasis from post-disaster reaction to pre-disaster prevention and risk reduction actions, and stress the importance of preventive approaches through the enhancement of research and knowledge capacities, the design and dissemination of risk mitigation measures as well as increased information, education and public awareness. The Alliance's vision is: expanding scientific and applied research, technical infrastructures and capacities for implementation of an effective risk mitigation action; reduction of risk in all types of built structures and ensuring that the future constructions are seismically safe; developing initiatives for the mitigation of earthquake risk in rural areas with emphasis on the provision of realistic, doable, affordable, simple methods and methodologies; and enhancing the level of disaster preparedness by increasing public awareness and promoting collective prevention. In the short term, the Alliance will ensure that post-Bam earthquake scientific and technical studies and investigations are conducive to the production of comprehensive and authoritative compendium on lessons learnt from the earthquake and guidelines for reducing future losses in similar cases. The long-term objective will be to enhance the monitoring of seismic activity, the assessment of seismic hazards, the investigation of geotechnical issues, the improvement of building design, of resilience of important public buildings, lifelines, infrastructure and cultural heritage, and the promotion of earthquake preparedness and disaster management.

# Chapter 3

## **Metrological Organization Atmospheric and Climate Disaster Working Group**

### **1. INTRODUCTION**

#### **1.1. A Brief Outline of Geography and General Conditions of the Country**

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 44° 02' E and 63° 20' E eastern longitude and 25° 03' N to 39° 46' N northern latitude. The country covers an area of about 1.648 million km<sup>2</sup>. Its neighbours consist of Azerbaijan, Turkmenistan and Armenia in the north, which are around the Caspian Sea, Afghanistan and Pakistan in the east and Turkey and Iraq in the west, as shown in Figure 1. The sea frontiers of the Persian Gulf and Oman Sea in the south connect this country to the high seas and southern neighbouring countries of the Persian Gulf. Geographically, as is shown in Figure 1, it is located in an area which was the focal point of contact and emergence of ancient civilizations.

Figure 1: I. R. of Iran, and its neighbouring countries.

Figure 2 shows that the country is in the arid belt of the world and is located in the Alpine belt in one of the most famous earthquake hazardous regions of the world. About 60% of the country is mountainous and the remaining part (1/3) is desert and arid lands. 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 2000 metres high; these reach more than 5000 metres in some places. In the west and southwest, the Zagros Mountains extend over a very long distance. Most of the area is over 1800 metres, much of it is over 3000

metres and many summits exceed 3600 metre. The great plateau, rising 1 km above sea level, occupies most of the country. Some parts, such as the Dasht-e-Lut and Sistan, are only about 500 m above the sea level. In regard to the Caspian Sea, there are some narrow lands of about 20 metres below sea level.

The population of the country is estimated to be 65,865,362 for the year 2000. Since 1881, the country's population has increased from 7.7 to 65 million individuals. In other words, the annual population growth has increased from 0.6% to 3.9% within the last 120 years. There are higher concentrations of people in the north and west, the population distribution of the country is shown in Figure 3. Tehran is the capital and the largest city. Other large cities are Mashhad, Tabriz, Isfahan and Shiraz. The central parts of the country covered by deserts and Salinas, are mainly uninhabited. While urbanization was the trend during the 1970s, the opposite was encouraged in the 1980s.

Figure 2: Topographical Map of Iran

Figure 3: Population Distribution and Spread

There are some closed basins among main mountain ranges such as Lake Urmia (The largest natural, permanent lake in Iran), Arak Desert, Tashk and Bakhtegan Lakes and Maharlu Lake.

Regarding the mentioned topographical features and from the viewpoint of surface water flows, Iran consists of six main hydrological catchments as follows:

- Caspian Sea catchment which covers the northern part of Azerbaijan Province, the northern slopes of Alborz and some eastern and northern

parts of Zagros slopes. All rivers in this region flow into the Caspian Sea;

- Persian Gulf and Oman Sea catchment covers Zagros in some main parts of its west and southwest heights and slopes;
- Lake Urmia catchment which covers the northern slopes of Zagros and eastern slopes of border mountains between Iran and Turkey as well as southern and western slopes of Mt. Sahand. All rivers in this area flow into Lake Urmia;
- Central catchment which covers all regions with flowing waters into central lakes, swamps, salina and deserts;
- North-eastern catchment named Gharaghoun Catchment and eastern catchment named Meshkil & Hamoun Catchment which consists of regions whose water flows into border swamps and salina and into Iran-Afghanistan and Iran-Pakistan borderlands.

The six main hydrological catchments of Iran are shown in Figure 4.

Figure 4: Main Hydrological Catchments of Iran

## **1.2. Climate**

The I. R. of Iran enjoys diverse climatic conditions, as shown in Figure 5, and the types of air masses that control the country's weather conditions are shown in Figure 6. Construction and engineering of residential areas in old towns and cities and in particular under harsh environmental conditions was mainly based on the climatic conditions. There are many examples of sophisticated and magnificent ancient monuments and buildings all around the country which are symbols of harmony of humans with the surrounding environment and the climate. It is therefore, apparent that the survival of our culture and civilization has been associated with adaptation and proper response to climatic conditions.

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 main 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 28°C. Cold winters, especially in the north in the Alborz Mountains are common. The January mean temperature in Mashhad is 2°C and the minimum is -25°C. On the plateau it is less cold than in the Alborz mountains. In summer hot weather generally prevails, in particular, in the low land area and enclosed valleys such as those of Khuzestan and Lorestan where the daily maximum often exceed 44°C. Summer temperatures of more than 55°C have been recorded.

Figure 5: Climatic Classification of Iran

Figure 6: Air masses over Iran

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 as high as 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 Alborz and Zagros slopes facing north and west respectively, where 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 of the precipitation. The plateau has most of its rainfall in spring, while on the western and southern coasts most of the rain falls in winter. On the Caspian coasts, where the rain falls earlier, the rainfall is at its maximum in autumn. In the dry period between May and October, rain is rare in most of the country. In other words, it seems that the temporal and spatial distribution of precipitation in Iran is volatile, as 90% of total precipitation occurs in cold and humid seasons and in northern and western parts of the country and only 10% occurs in warm and dry seasons and in central, southern and eastern parts. About 52% of precipitation occurs in 25% of the area of the country, hence some parts of the country will suffer a lack of water resources and water crises in the near future.

### **1.3 A brief outline of Disaster Reduction and Risk Assessment in the Islamic Republic of Iran**

Hazards are an unavoidable part of The hazards we face are very diverse. They arise from our society (for example, conflict, terrorism, civil strife) and technology (industrial and transport accidents), as well as natural hazards and threats to public health. Risk, and how we manage it, has become a subject of increasing research and debate in recent years. At the close of the twentieth century, natural hazards and consequence disasters are one of the most common forms of disasters around the world. They continue to be destructive and, if anything, they are more prevalent and harmful than centuries ago, despite some outstanding achievements. The application of

science and technology has undoubtedly improved humankind's ability to predict, alleviate and survive disasters, but over time population growth and social, economic and political processes have massively increased human exposure and vulnerability to these hazards.

At the dawn of the third millennium a world without hazards and disasters is, unfortunately, unthinkable and unachievable, but it is possible to reduce them. Much has been achieved, and there is no excuse for not pursuing the ultimate causes of these problems and finding imaginative ways of containing and lessening their impacts. Many successful ways of reducing hazards and disasters are regularly being found and implemented. There is no rationale for not seeking to avoid the death and destruction that is likely to occur during the next centuries, and to alleviate the suffering of those in many regions of the world. Careful hazard assessment and planning, and a range of social, economic and political measures, can significantly contain these threats. Our hopes for containing and lessening the death and destruction that disasters cause are most likely to be achieved through a more balanced understanding of their nature. Such an understanding is likely to emphasize the importance of societal conditions in producing hazards and disasters, while not ignoring the environmental processes which generate and the effects of human actions upon these processes.

The Islamic Republic of Iran, is a highly disaster-prone country, suffering from droughts, floods, earthquakes, rising sea level, landslides, as well as man-made and technological disasters. The hazards in the country can be classified into three major types as follows:

### **Type 1: NATURAL HAZARDS**

Natural processes or phenomena occurring in the biosphere that may constitute a damaging event. Natural hazards can be classified by origin in: Climatic and Weather, Geological and Biological.

#### **1.1 Climate and Weather hazards**

Natural processes or phenomena of atmospheric, hydrological or oceanographic nature are as follows:

- Floods, debris and mud flows;
- Tropical cyclones, storm surges, thunder/ hailstorms, rain and wind storms, blizzards and other severe storms; localized strong wind, frost, heavy, rainfall;

- Drought, desertification, wildland fires, heat waves, sand or dust storms;
- Permafrost, snow avalanches.

## **1.2. Geological hazards**

Natural earth processes or phenomena in the biosphere, which include geological, geotectonic, geophysical, geomorphological, geotechnical and hydrogeological nature are as follows:

- Earthquakes;
- Emissions;
- Landslides, Rockslides, Rock falls, liquefaction, Submarine slides;
- Subsidence, Surface Collapse, Geological fault activity.

## **1.3. Biological hazards**

Processes of organic origin or those conveyed by biological vectors, including exposure to pathogenic micro-organisms, toxins and bioactive substances.

Outbreaks of epidemic diseases, plant or animal contagion, and extensive infestations.

## **Type 2: TECHNOLOGICAL HAZARDS**

Danger originating from technological or industrial accidents, dangerous procedures, infrastructure failures or certain human activities, which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. These are sometimes referred to as anthropogenic hazards. Some examples: industrial pollution, nuclear activities and radioactivity, toxic wastes, dam failures; transport, industrial or technological accidents (explosions, fires, spills).

## **Type 3: ENVIRONMENTAL DEGRADATION**

Processes induced by human behaviour and activities (sometimes combined with natural hazards), that damage the natural resource base or adversely alter natural processes or ecosystems. Potential effects are varied and may contribute to an increase in vulnerability and the frequency and intensity of natural hazards.

Some examples are: land degradation, deforestation, desertification, wildland fires, loss of biodiversity, land, water and air pollution, climate change, sea level rise, ozone depletion.

Figure 7: I. R. of Iran Map and its Provinces.

Figure 8: Percentage of Natural Disasters Events in I.R. of Iran (1990-2002), Source: NCNDR, 2002.

Population displacement and the hundreds of thousands of refugees in recent years have hampered I.R. of Iran development efforts, costing thousand of lives and billions of dollars worth of financial losses. Furthermore, the increasing trend of population growth, rapid urbanization and so on have progressively increased the losses arising from different natural disasters, having in mind the above facts planning for reduction of natural disasters impacts, establishment of appropriate study & implementing structures as well as enhancing public awareness. The most important climate and weather related disasters in the country, are flood and drought. For example, one of the most hazardous floods happened in Golestan and north of Khorasan Provinces, located in the north of Iran, in August 2001. More than 300 persons died and more than IR Rials 640,000 Million (US\$ 80 Million), where the total international financial help was US\$ 1 Million. Another hazardous flood has happened in the same area on August 2002. The damages was recorded as IR Rials 70,000 million (US\$ and million) and 30 persons died. In this regard, according to the responsibility of I. R. of Iran Meteorological Organization (IRIMO) on the flood preparedness, the early warning issue of the mentioned flood, issued within 48 hours in advance.

On the other hand, drought has been a recurrent phenomenon in I. R. of Iran for the last several decades. A warming trend that began in the early 1990s has continued in recent years, despite some cooling, and annual mean temperatures have remained above average for the last several years. A significant drought was observed during the winter and spring from 1998 to

2001. Almost two-thirds of the country, mainly the south-eastern and central regions, experienced severe drought.

In recognition of the disastrous impact of natural hazards on vulnerable communities, the United Nations General Assembly proclaimed, in 1989, the International Decade for Natural Disaster Reduction (IDNDR), 1990-2000. Its objectives were to reduce the loss of life and property damage, social and economic disruption caused by natural disasters through concerted international action and propriety use of science and technology. In the regard of the IDNDR, it was stated that "we must, above all, shift from a culture of reaction to a culture of prevention", where prevention is not only better than cure; it is also much cheaper. Much of the damage that occurs in disasters results from a lack of action to reduce vulnerability before the disaster happens. Practical precautions to safeguard property are often insufficient, whilst in many cases damage prevention can be achieved at a fraction of the cost of rebuilding. Post disaster rehabilitation not only needs to address rebuilding, but also greater safety before the arrival of the next disaster.

Since 1993 in Islamic Republic of Iran, a national system for the prevention and attention of disasters has been designed. More recently, in 1998 the government adopted the national plan on natural disasters prevention. This contains polices, actions and programs, with national, regional and local characteristics. The plan includes financial, educational and research aspects in the field of disasters prevention. Our domestic efforts have been supplemented through the implementation of programs of international cooperation. In this regard, we have strengthened our relations of cooperation and collaboration with other successful countries.

During IDNDR, we have witnessed an increase and variety of natural disasters that have caused disruptions in daily life of all affected sectors of country. They have meant the loss of human, economic and environmental resources of incalculable dimensions. During our studying we understood that there is relationship between natural disasters and sustainable development. It means that reduction of natural disasters should be maintained under the study of environment and sustainable development issues. The IDNDR has allowed all countries to gain a greater and better understanding of the magnitude of the risks and of the importance of having early warning systems to mitigate the devastating effects of natural disasters. We must now give the necessary impetus to our government to continue with this important work through the definition of clear guidelines.

As vulnerability to natural disasters has increased globally, greater attention has been directed to reducing risks associated with its occurrence through the introduction of planning to improve operational capabilities and mitigation measures that are aimed at reducing the disaster's impacts. In the past, when a natural hazard event and resultant disaster has occurred, governments have followed with impact assessment, response, recovery, and reconstruction activities to return the region or locality to a pre-disaster state. Little attention has been given to preparedness, mitigation, and prediction/early warning actions (i.e., risk management) that could reduce future impacts and lessen the need for government intervention in the future, as shown in Figure 9.

Risk management is a process consisting of well-defined steps which, when taken in sequence, support better decision making by contributing to a greater insight into risks and their impacts. It is as much about identifying opportunities as it is about avoiding losses. By adapting effective risk management techniques we can help to improve safety, quality and business performance in our society. Risk management is the weighing of the assessed risks of a particular action or decision against the benefits that may be gained from the action or decision. It involves full consideration of all risks and those factors, which influence risk, including uncertainty, so that reasonable and responsible decisions can be made. Risk management is generally accomplished through policy (regulation) and through individual decisions.

The ability to effectively assess and manage risk is affected by all the factors, the difference between real and perceived risk, uncertainty related to risk and the inability to appropriately value the costs and benefits of risks.

Figure 9: Risk Management vs. Crisis Management Circle

Government resources have been significantly curtailed in recent years and this has impacted its ability to assess and manage risk. This is not to say that without optimal resources, risk assessment and management cannot be achieved, but rather, the government is only able to assess and manage risk relative to its available resources. As such resources must be allocated so as to best assess and manage risk given the constraints. In doing so, the process of allocating resources to assess and manage risk should withstand public scrutiny and be defensible when challenged. Natural disaster preparedness and management are effective strategies to reduce risks and therefore the impacts associated with the disasters, as shown in Figure 9. Preparedness for natural disaster necessitates greater institutional capacity at all levels of government and more efficient coordination between different levels of government. Preparedness also implies increasing the coping capacity of individuals and communities to deal with disaster events.

Most commonly, there are three components in a natural disaster plan: monitoring and early warning; risk assessment; and mitigation and response. Given the improved tools and technologies available today, it is possible to provide disaster information and minimize the potential damage of disasters. In the regards of natural disaster risk reduction in the country, the I. R. of Iran Meteorological Organization (IRIMO) has designed a National Disaster Early Warning System (NDEWS), the general features of the NDEWS are shown in Figure 10.



Figure 10: National Disaster Early Warning System in I. R. of Iran (NDEWS), Source: IRIMO and CRI, 2001.

## **2. National Report on Risk Reduction**

### **2.1 Political Commitment and Institutional Aspects**

#### *National policy, strategy and legislation on disaster risk reduction*

There is a good national policing strategy, and legislation addressing disaster risk reduction in I. R. of Iran.

In regard to natural disaster reduction, it is well-known that the United Nations General Assembly proclaimed, in 1989, the International Decade (1990-2000) for Natural Disaster Reduction (IDNDR), since 1993 a national system for the prevention of disaster has been designed. Then, in 1998 the government adopted the national plan on natural disasters prevention, which contains polices action and programs, with sector as well as national, regional and local characteristics which is entitled National Committee for Natural Disaster Reduction (NCNDR). For this propose, the Ministry of Interior of the I. R. of Iran has been legally assigned to function as the coordinator of all activities related to the immunization and prevention of life and property losses. In this regard implementing agencies, governmental organizations are charged to observe the Ministry of Interior's policies at provincial, town, and district levels. In this context, the disaster task force of the Ministry of Interior which is the control coordinator of disaster management in the country commenced its activities on March 1991. Some rules and laws which consider risk management and reduction of the national catastrophic effects include:

- Laws collection about water and disaster;
- Pay attention and promotion of knowledge management in long term plan;
- Necessity of considering risk management in national project.

As a matter of fact, all disaster risk reduction related activities including the following steps are the strategic priorities of the country:

#### a) Pre-Disaster Phase

##### *Risk Identification*

- Hazard assessment (frequency, magnitude and location);
- Vulnerability assessment (population and assets exposed);

- Risk assessment (a function of hazard and vulnerability);
- Hazard monitoring and forecasting (GIS, mapping, and scenario building).

#### *Mitigation*

- Physical/structural mitigation works;
- Land-use planning and building codes;
- Economic incentives for promitigation behaviour;
- Education, training and awareness about risks and prevention.

#### *Risk Transfer*

- Insurance/reinsurance of public infrastructure and private assets;
- Financial market instruments (catastrophe bonds, weather-indexed hedge funds);
- Privatization of public services with safety regulation (energy, water, transportation, etc.);
- Calamity Funds (national or local level).

#### *Preparedness*

- Early warning systems (communication systems);
- Contingency planning (utility companies/ public services);
- Networks of emergency responders (local/ national);
- Shelter facilities. (evacuation plans).

#### b) Post-Disaster Phase

##### *Emergency Response*

- Humanitarian assistance;

- Clean-up, temporary repairs and restoration of services;
- Damage assessment;
- Mobilization of recovery resources (public/ multilateral/ insurance);

*Rehabilitation and Reconstruction*

- Rehabilitation/reconstruction of damaged critical infrastructure;
- Macroeconomic and budget management (stabilization, protection of social expenditures);
- Revitalization for affected sectors (exports, tourism, agriculture, etc.);
- Incorporation of disaster mitigation components in reconstruction activities.

In recent years, for example, in 2003 in order to develop activities of more wide range of disaster risk reduction, the government approved the National Integrated Rescue and Relief Plan, (NIRRP) as a replacement for NCNDR based on the law No. 44 of the third development economic, social, cultural and educational programme in the Islamic Republic of Iran, which has been introduced by the government.

## **2.2. National body for multi-sector coordination and collaboration in disaster risk reduction**

There is a successful national body for multi-sector coordination and collaboration in disaster reduction in I. R. of Iran.

The NCNDR includes nine sub committees as follows;

1. Atmospheric and climate disaster committee;
2. Air pollution disaster committee;
3. Medicine and health disaster committee;
4. Over flowing of rivers and flood disaster committee;
5. Identification of disaster committee;
6. Rescue and relief committee;
7. Drought and restoring pasture disaster committee;
8. Earthquake and landslide committee;
9. Desertification, drought plant protection, and chilling committee.

In 2003 based on the approved third national development programme of the country some of the involved ministries are as following:

- Ministry of Housing and Urban Development;
- Ministry of Jihad-e Agriculture;
- Ministry of Power;
- Environmental Protection Organization;
- Ministry of Road and Transportation.

In the NIRRP, four main subjects are reviewed:

- Prevention;
- Preparedness and Early Warning;
- Advocacy;
- Reconstruction.

The main goals of this plan are as follows:

1. Organizing and combining all the components and the factors of crisis management;
2. Using all national and provinces equipments;
3. Leading the foreign and inter-governmental and non-governmental aids for prevention and reduction of natural disaster impacts;
4. Promote the performance of rescue and relief;
5. Reduction of human and industrial damages;
6. Compensate and reconstruction and return the living conditions into initial situation before crisis.

In this plan there are three major committees as follows:

1. Professional training committee involving 5 sub-committees;
2. Prevention and hazards management committee involving 6 sub-committees;
3. Operational committee involving 12 sub-committees.

The professional training committees are as follows:

- Public training subcommittee (Red Crescent);
- Professional training sub-committee (Ministry of Science, Research and Technology);
- Schools training sub-committee (Ministry of Education);
- Media sub-committee (Ministry of Culture);
- Iranian radio and Television (IRIB)

Professional prevention and hazards management sub-committees are as follows:

- Earthquake and landslide and sub-committee (Ministry of Housing and Urban Development);
- Plant protection and chilling subcommittee (Ministry of Jihad-e Agriculture);
- Professional subcommittee for pastures rehabilitation and drought effects mitigation;
- Professional flood and river overflowing sub-committee (Ministry of Power);
- Air pollution sub-committee (Environmental Protection Organization);
- Atmospheric and climatic disaster sub-committee (I. R. of Iran Metrological Organization).

Professional operation sub-committees are as follows;

- Professional rescue sub-committee (Red Crescent of Iran);
- Professional medicine and health sub-committee (Ministry of Health and Medical Education);
- Professional transport sub-committee (Ministry of Road and Transportation);
- Professional communication sub-committee (Ministry of Communications and Information Technology);
- Professional debris and burial sub-committee (Ministry of Interior);
- Fire organization and dangerous matters sub-committee (Ministry of Interior);
- Professional oil matters sub-committee (Ministry of Oil);
- Professional protection sub-committee (Ministry of Interior);
- Professional electricity, water and surplus water management sub-committee (Ministry of Power);

- Professional house providing sub-committee (Ministry of Housing and Urban Development);
- Professional Agriculture (ministry of Jihad-e- Agriculture) ;
- Professional industries and mine sub-committee (Ministry of Industries and Mine).

### **2.3 Sector plans that incorporate risk reduction concepts in to respective development area**

These plans have been operated in governmental sectors . Examples include the installation of early warning systems, the plan of risk management, the integrated plan of drought, climate change and its effects plan, pattern of optimum water consumption plan, holding special training courses in the field of natural disaster reduction.

## **2.4 Incorporation of disaster risk reduction in to national plan for the implementation of the MDGS1, PRSP2 and WSSD3**

[To be completed]

## **2.5 Building codes of practice and standards in places of seismic risk**

*Seismic cities of Iran and the efforts to reduce earthquake hazards in Iran.*

During this century, more than a thousand destructive earthquakes have occurred in 70 countries and 1.53 million people have lost their lives. 80 percent of these deaths are concentrated in six countries, China, Iran, Indonesia, Peru, USSR, Guatemala and Turkey. 17.6 percent of 153 destructive earthquakes occurred in Iran.

Some destructive earthquakes and their damages are indicated in appendix 1-5. Iran is the most active area in the world seismically. Statistics show during the past 6 decades, at least 12 earthquakes with a force of six on the Richter scale occur. On average 1 serious earthquake occurs ever 5 years.

Some of these earthquakes are summarized as follows, North Khorasan earthquake of 1929, North-west salmas earthquake of 1930, Saravan earthquake of 1933, North Khorasan earthquake of 1948, Larijan earthquake of 1957, Bouin-zahra earthquake of 1962, Baiaz plain Khorasan earthquake of 1968, Bandar Abbass earthquake of 1977, Tabas earthquake of 1978, Gazvin earthquake of 1979 and Roudbar-Manjil earthquake of 1990. In comparison with other destructive earthquakes of the world, the earthquake damages in Iran are particularly high. For example; the Manjil-Roudbar earthquake, in Iran, with M=7.6, caused 15000-35000 deaths, 50000 people were injured and economic loss has been estimated at about 2.5% GNP .

The number of deaths, injured and economic loss in Iran is very high and Iran is especially vulnerable to earthquakes. Therefore, designing earthquake resistant buildings and infrastructures is very important.

35% of the Asian earthquakes of the twentieth century occurred in Iran which indicate that Iran is very active seismically.

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1- UN Millennium Development Goals  
2 - Poverty Reduction Strategy Paper  
3 - World Summit On Sustainable Development

## **2.6 Annual budget for disaster risk reduction**

Generally, 2.5 percent of the total annual budget of the I. R. of Iran is allocated to natural disaster reduction. 1.5 percent of this sum is allocated to advocacy and reducing damage and the remainder is for risk reducing and risk management. In addition, during serious catastrophes, a special part of the budget is used to aid reconstruction and repairing the damage.

## **2.7 Participation of Private sector, Civil society, NGOs and media in disaster risk reduction efforts**

In order to achieve the goals of national platforms for Disaster Risk Reduction towards more resourced, effective and integrated efforts of risk reduction amongst national stakeholders and amongst national, regional parties, the following NGOs have been organized:

- National Youth Organization;
- Meteorological Volunteer Centre;
- Related environmental activities.

With the cooperation of the above-mentioned NGOs, the national platforms for DRR can serve as tools for informed decision-making, providing a framework for systematic thought and commitment to priority actions across sectors and territory

### **3. Risk Identification**

#### **3.1 Hazard mapping/assessment**

The objective of a hazard assessment is to identify the probability of occurrence of a specified hazard, in a specified future time period, as well as its intensity and area of impact. For example, the assessment of flood hazards is extremely important in the design and setting of engineering facilities and in zoning for land use planning. Construction of buildings and residences is often restricted in high flood hazard areas. Flood assessment should be developed for the design and setting of sewage treatment as well as land and buildings having industrial materials of a toxic or dangerous nature, due to the potential spread of contaminants. The classification of hazard mapping techniques, as proposed by Aleotti and Chowdhury 1999, helps practitioners select a hazard assessment technique that best suits the project goals, available data, and budget. For example, GIS-based index overlay techniques are more suited for national and regional scale studies and are useful for producing qualitative hazard susceptibility maps. Probabilistic-based assessments are more applicable for data intensive, large-scale projects and are useful if the quantification of absolute hazard and risk are the goals.

In regard to the huge damages in Iran, this country has carried out the hazard mapping /assessment for some of the natural disaster like drought, floods and earthquakes.

We use GIS as a tool for effective and efficient storage and manipulation of remotely sensed data and other spatial and non-spatial data types for both scientific management and policy oriented information. This can be used to facilitate measurement, mapping, monitoring and modelling of variety of data types related to natural phenomenon. The specific GIS applications in the field of risk assessment are: Hazard Mapping to show earthquakes, landslides, floods or fire hazards. Remote sensing makes observation of any object from a distance and without coming into actual contact possible. Remote sensing can gather data much faster than ground based observation, can cover a large area at one time to give a synoptic view. Remote sensing comprises Aerial Remote Sensing which is the process of recording information, such as photographs and images from sensors on aircrafts and Satellite Remote Sensing which consists of several satellite remote sensing system which can be used to integrate natural hazard assessments into development planning studies. These are: Landsat, SPOT Satellite, Satellite Radar System and Advanced Very High Resolution Radio.

For example, Flood hazard maps are used to define the extent frequency and magnitude of the hazard. The approaches to flood hazard mapping outlined were:

1. The simple approach – mapping of past and or existing flood zones as an indicator of areas at risk;
2. The detailed approach in which computer models are used to identify the actual location of water levels in the event of a flood.

The methodology for development of hazard maps will require:

1. The application of hydraulic analysis to peak flow data for several river cross sections.
2. The hydraulic analysis will determine the level of water for a given flood event;
3. The hydraulic analysis will calculate the expected water levels for given peak discharges and given channel and over bank conditions.

These mapping are provided in national and local scale, some of them are shown in Appendix 2.1.

Hazard mapping and vulnerability assessments have been incorporated into the development planning process. A number of methods have been explored to ensure that hazard mapping and vulnerability assessment are taken into account in policy decision making. They were:

- Promotion of an integrated approach to development;
- The involvement of the widest cross section of persons in studies and projects (networking);
- Application of research;
- Making information available;
- Ensuring that the information produced is understandable

A number of tools for mapping are available to arrange and display information for the use of technical experts, to explain programmes of hazards damage reduction to the decision- makers and to communicate real time

forecasts and warnings to the public. In general, the tools should be interactive in the sense that the information can be easily updated, flexible enough to develop scenarios and to provide visual and quantitative information regarding the conditions during the forecasted event.

In Iran some applications of GIS and remote sensing tools in various hazards are as follows:

### ***Drought***

Mapping by using GIS and Remote Sensing can be used in drought relief management such as early warning of drought conditions.

### ***Floods***

Satellite data can be effectively used for mapping and monitoring the flood areas, flood damage assessment, flood hazard zoning and post-flood survey of rivers configuration and protection works. The classification of flood prone areas is carried out daily. The daily probability of floods is also forecast. The purposes of flood hazard mapping in Iran are:

- a. To identify areas prone to flooding and/or at risk;
- b. To determine magnitude of the hazard-height of water level;
- c. To determine frequency of occurrence.

### ***Earthquake***

Mapping using GIS and Remote Sensing can be used for preparing seismic hazards maps in order to assess the exact nature of risks.

Valuable information on individual natural hazards may appear on maps with varying scales, coverage, and detail. Information from several of them can be combined in a single map to give a composite picture of the magnitude, frequency, and area of effect of all natural hazards. By facilitating the interpretation of hazard information, it increases the likelihood that the information will be used in the decision-making process- either in the planning of new development projects or the incorporation of hazard reduction techniques into existing developments.

These hazard mapping can be used for wide variety of purposes ranging from flood plain delineation, zoning and land use planning to presentation of information at public meetings, and defining the extent, frequency and

magnitude of hazards. Usually they are updated weekly and monthly, and their geographical scales are 1:250000 km.

These hazard maps include their characteristics, impacts and historical data approach. Many institutions use the hazard maps, Ministry of Jihad-e-Agriculture, Ministry of Power, Ministry of Interior, Environmental Organization, universities and research centres. Evidently, they are available for all interested people.

IRIMO has provided a climatic atlas which list of these maps is as following:

### **List of Maps in the Climatic Atlas of I. R. of Iran by IRIMO**

The Climatic Atlas of I. R. of Iran has been produced based on long-term period data of all types of networks of IRIMO and also application of professional soft-wares. This Atlas provides unique and helpful information, and is an effective tool in disaster risk assessment. It includes more than 350 maps. The main titles of the climatic maps in this Atlas are as follows:

#### **1. Sunshine**

- Monthly average of sunshine hours;
- Annual average of sunshine hours.

#### **2. Precipitation**

- Monthly average No. of days with precipitation more than 1mm;
- Annual average No. of days with precipitation more than 1mm;
- Monthly average No. of days with precipitation more than 5mm;
- Annual average No. of days with precipitation more than 5mm;
- Monthly average No. of days with precipitation more than 10mm;
- Annual average No. of days with precipitation more than 10mm;
- Monthly average No. of days with precipitation;
- Annual average No. of days with precipitation;
- Monthly average maximum precipitation in 24 hours;

- Monthly average of maximum precipitation in 24 hours with 20% probability;
- Annual average of maximum precipitation in 24 hours with 20% probability;
- Monthly average of maximum precipitation in 24 hours with 80% probability;
- Annual average of maximum precipitation in 24 hours with 80% probability;
- Monthly average of maximum precipitation in 48 hours;
- Annual average of maximum precipitation in 48 hours;
- Monthly average of maximum precipitation in 72 hours;
- Annual average of maximum precipitation in 72 hours;
- Monthly average of maximum precipitation in 96 hours;
- Annual average of maximum precipitation in 96 hours;
- Monthly average percent of precipitation;
- Seasonal average percent of precipitation;
- Monthly average of variation coefficient of annual rainfall;
- Monthly average precipitation;
- Seasonal average precipitation;
- Annual average precipitation in long-term period;
- Annual coefficient of rainfall variation.

### **3. Temperature**

- Monthly minimum temperature;
- Annual minimum temperature;
- Monthly average daily temperature;
- Annual average daily temperature;
- Monthly absolute minimum temperature;

- Annual absolute minimum temperature;
- Annual maximum temperature;
- Monthly maximum temperature;
- Monthly absolute maximum temperature;
- Annual absolute maximum temperature.

#### **4. Pressure**

- Monthly average QFF 0000;
- Monthly average QFF 0600;
- Monthly average QFF 1200;
- Monthly average QFF 1800;
- Monthly average QNH pressure.

#### **5. Humidity**

- Annual average relative humidity;
- Monthly average relative humidity.

#### **6. Evaporation**

- Monthly average evaporation;
- Annual average evaporation.

### **3.2 Vulnerability and capacity assessments**

The aim of vulnerability and capacity assessment is to help emergency managers and municipal planners to better understand and therefore be able to meet the needs of their vulnerable populations, particularly in an emergency situation. With low susceptibility (exposure to danger) and high resilience (Adaptability, capacity to review), vulnerability will decrease.

When disasters occur, they do not affect everyone in the same way. In emergency planning, it is important to pay special attention to the needs of people who are deemed particularly at risk, or the “most vulnerable”.

The common view is that “vulnerable populations” include the very young, the very old, women, people with disabilities and perhaps

aboriginal/First Nation peoples. Unfortunately, while partially accurate, this view of the “most vulnerable” is often misleading and could result in inappropriate response expectations or activities. It is important in the emergency planning process to distinguish more specifically what group of people is deemed to be among the “most vulnerable”, their general location within the community, and their expected capacity to respond or recover from disasters. Worth noting is the fact that one criterion, poverty, clearly stands out as a common thread among the “most vulnerable”.

*Vulnerability* is a function of the prevalent hazards and the characteristics and quantity of resources or population exposed to those effects. Vulnerability can be estimated for individual structures, for specific sectors or for geographic selected geographic areas, e.g. areas with the greatest development potential or already developed areas in hazardous zones.

*Capacity* is the cumulative ability of a person to take action when necessary, based on a number of factors: cognitive faculties, physical characteristics, personality factors, financial and other resources, knowledge, experience, link to others, and opportunity.

That “capacity” is based on specific requirements or needs and the distinct ability at that time to either employ or access needed resources. The assessment of capacity level is also a function of time and is typically modified over time, following changes to the operational environment or personal circumstances.

In support of the development of the information base for hazard mitigation planning, vulnerability assessments were undertaken for critical public infrastructure in I. R. of Iran. For carrying out vulnerability assessments special in the regards of natural disasters, the following steps have been considered:

- Hazard Identification;
- Hazard Analysis;
- Critical Facilities Analysis;
- Societal Analysis;
- Economic Analysis
- Environmental Analysis;
- Mitigation Opportunities Analysis.

The results of a vulnerability assessment can be used to prioritize mitigation activities and can help inform disaster recovery, mitigation and response planning.

A great deal of work has been focused on the assessment of the physical aspects of vulnerability. This has been done mainly in relation to more conventional hazardous phenomenon, such as types of disasters specially drought and floods.

These vulnerability assessments were carried out using critical infrastructure databases and hazard maps developed under the project. The vulnerability assessments were automated in the existing national geographic information system databases.

Both hazard and vulnerability/capacity assessments utilize formal procedures that include collection of primary data, monitoring, data processing, mapping, and social surveys techniques, among others. In the case of hazard assessment, where usually high technological developments for monitoring and storing data of geological and atmospheric processes are involved, the assessment activities are mostly restricted to a scientific community. On the other hand, vulnerability and capacity assessments make use of more conventional methodologies and techniques, by which the community at risk may also play an active role, such as in community-based mapping.

Following the recommendation of the Yokohama Strategy to include disaster reduction into national development plans, vulnerability and capacity assessment in relation to natural hazards is being introduced as an integral part of the situation analysis process at the country level. Considering, the importance of relation between high capacity and low vulnerability, for most of the natural hazards the following steps appear as future challenges for the country:

Step 1 – Create Planning Team;

Step 2 – Set Parameters;

Step 3 – Gather Information;

Step 4 – Define and Map Population;

Step 5 – Define High Densities;

Step 6 – Divide into Operational Sectors;

- Step 7 – Define High-Risk areas;
- Step 8 – Identify Most Vulnerable categories;
- Step 9 – Categorize Most Vulnerable sites;
- Step 10 – Identify MV “presence”;
- Step 11 – Identify risk intersection;
- Step 12 – Identify critical periods;
- Step 13 – Estimate needs;
- Step 14 – Identify expectations;
- Step 15 – Identify changes;
- Step 16 – Prioritize;
- Step 17 – Identify issues and take action.

### **3.3 Mechanisms for risk monitoring and risk mapping**

The Islamic Republic of Iran is particularly vulnerable to natural disasters such as drought, floods and earthquakes. It is almost impossible to fully recoup the damage caused by disasters but based on Yokohama principles we could reduce many losses by application of different Information Technology systems in different parts of the country. In this case, advanced Information Technology, such as Internet, GIS, Remote Sensing and Satellite Communication among others are used in planning and implementation of hazards reduction measures.

GIS can improve the quality and power of analysis of natural hazards assessments, guide development activities and assist planners in the selection of mitigation measures and in the implementation of emergency preparedness and response action. The satellite technology in general, and Remote Sensing in particular, are tools which can very effectively contribute towards the identification of hazardous areas, monitor the planet for its changes on a real time basis and provide early warning for many impending disasters. Communication satellites have become vital for providing emergency communication and timely relief measures. Integration of space technology inputs into natural disaster monitoring and mitigation mechanisms is critical

for hazard reduction and disaster response. It is absolutely necessary to create awareness among the public as well as decision makers for allocating resources for appropriate investments in disaster risk information management system.

Examples of using this system in the Islamic Republic of Iran are as follows:

### ***Drought***

Drought Risk Monitoring in the I. R. of Iran is carried out based on the drought indices, where IRIMO in cooperation with CRI, provide the operational drought monitoring mechanism, where such information plays a vital role in supporting agricultural and water resources management related sectors and others which are vulnerable to drought.

GIS and Remote Sensing can be used in drought relief management such as early warnings of drought conditions will help to plan the strategies to organise relief work. Satellite data may be used to target potential ground water sites for taking up well-digging programs. Satellite data provides valuable tools for evaluating areas subject to desertification. Film transparencies, photographs and digital data can be used for the purpose of locating, assessing and monitoring deterioration of natural conditions in a given area. In the Islamic Republic of Iran with using of long ranged climate models, we could prepare and give early warning for drought disaster.

In this regard, several types of scientific software are applied to provide needed risk mapping. In the future we hope to apply some indices like I. R. of Iran Drought Composite Index (IRIDCI) for better monitoring. For risk mapping, we could provide some maps for drought prone areas in Iran.

### ***Floods***

The preparedness for flash floods could be provided by using land-use maps of satellite data and local rainfall measurement. For major floods, we could provide flood plain maps and land use maps and also, with measuring of regional rainfall and evapotranspiration could give early warning for floods.

### ***Earthquake***

The Islamic Republic of Iran is located on seismic fault lines and is prone to earthquakes.

GIS and Remote Sensing could be used for mapping geological lineaments land use in order to assess the exact nature of risks.

### ***Landslides***

Landslide zonation map comprises a map demarcating the stretches or areas of varying degree of anticipated slope stability or instability. The map has an inbuilt element of forecasting and is therefore of a probabilistic nature. Depending upon the methodology adopted and the comprehensiveness of the input data used, a landslide hazard zonation map be able to provide help concerning location, the extent of the slope area likely to be affected, and rate of mass movement of the slope mass.

This information is disseminated by two methods-public and special dissemination. Main users of this information are the Ministry of Power, Ministry of Agriculture and Meteorological Organization.

### **3.4 Systematic socio-economic and environmental impact and loss analysis after each major disaster**

There is an active and succeeded systematic socio – economic and environmental impact and loss analysis in I. R. of Iran for most disasters. According to the integrated rescue and relief plan, there are some organizations which are responsible for the nation’s help and reconstruction. For example, the special rescue sub-committee based on Iran Red Crescent responsibility. Some sub-committees are as follows:

- 1- Professional rescue sub-committee;
- 2- Professional health and medicine sub-committee;
- 3- Professional transport sub-committee;
- 4- Professional house providing sub-committee;
- 5- Professional communication sub-committee.

The rescue sub-committee is responsible for rescue, landing, plant protection and chilling sub-committee mediate and estimate the losses and damages during the disasters.

For example:

- The rescue sub-committee is responsible for rescue relief activates;
- The protection and chilling sub-committee is responsible for estimating the damages.

### 3.5 Warning systems in place

There are early warning systems for some disaster such as droughts, floods and frost.

At the beginning of the twenty-first century, disasters are increasingly affecting societies worldwide, draining resources that could be better used for development and poverty reduction initiatives. There is an urgent need for the implementation of effective early warning systems.

The importance of early warning is recognized in Agenda 21 and the current follow-up processes. In addition, a particular focus is given by the international community to early warning in the structure and programs of the international strategy for Disaster Reduction (ISDR). The 1998 Potsdam international conference on early warning systems for Reduction of Natural Disasters (EWC'98) confirmed early warning as a core component of national and international prevention strategies for the 21<sup>st</sup> century.

In the country the National Disaster Early Warning system (NDEWS) has been designed and is operated by IRIMO in cooperation of CRI., the following chart shows the general features of the NDEWS.

The NDEWS has been applied mostly for drought and flood disasters, and this system covers all parts of the country.

In the regards of lessons-learnt from the use of NDEWS, as it is discussed in Appendix 5, the early warring systems successfully do help to public for disaster risk reduction.



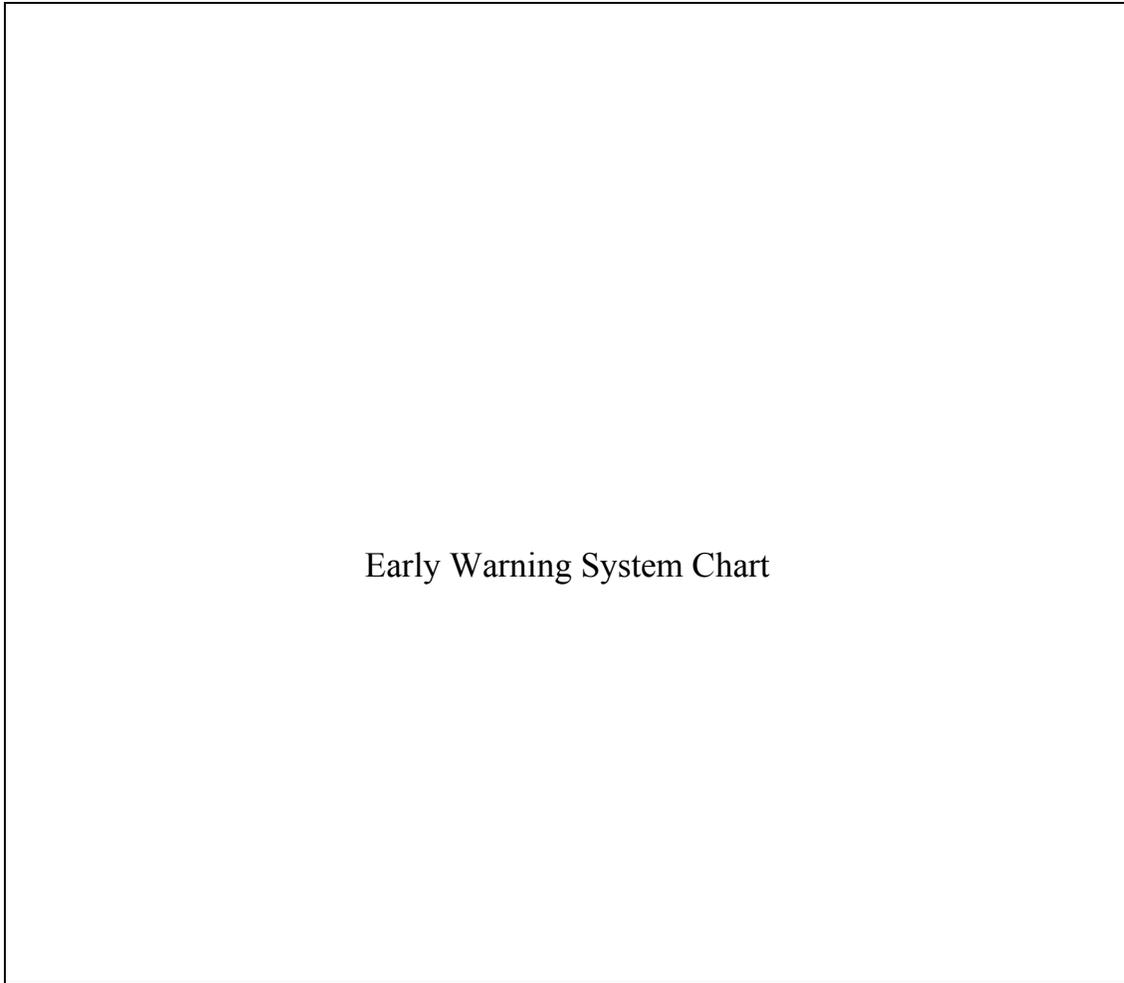


Figure 10: National Disaster Early Warning System in I. R. of Iran (NDEWS), Source: IRIMO and CRI, 2001.

Also, in the case of some natural disasters such as dust storms and heavy rainfall, IRIMO has carried out some researches to forecast and timely early warning.

## **4. Knowledge Management**

### **4.1 Disaster risk information management system (Governmental and non-governmental)**

Over the last few decades, the importance of effective management of information has been recognized in the disaster management sector. The Islamic Republic of Iran is establishing disaster management information system for effective management of disaster. Applications of these systems range from emergency response planning in short range early warning to long range mitigation and prevention planning.

It is evident that accurate and relevant information could significantly reduce the loss of life and financial costs of the disaster risks. Effective disaster risk management depends upon a series of related actions and the means to engage the informed participation of all stakeholders. The exchange of information and communication practices plays a key role in the realization of these activities. Data availability is crucial for ongoing research, to monitor hazards and for assessing risks. Information describes working conditions, provides reference material and allows access to resources. Rapid and widespread developments in modern communications record and disseminate the value of experience, convey professional knowledge, and contribute to decision-making processes. Integrating new developments in information management with established and more traditional methods help to create a much better understanding about hazards and risk at all levels of responsibility through public awareness programmes. Effective information management and communication about disaster risk reduction is conveyed through:

- An awareness of current issues of information management;
- An appreciation of initiatives around the world;
- Selected national information programmes;
- Technical information, experience about different hazards;
- Using cyberspace to discuss disaster risk reduction.

Critical analysis and assessment of the implications of the occurrence of natural or man-made hazards need information comprising both spatial and non-spatial related to factors influencing the hazards. If such information is available, it would be immensely useful in:

1. Identification of the processes responsible for the hazards and the natural resources and socio-economic parameters associated with the process;
2. Planning appropriate preventive measures/preparedness
3. Assessing damage caused by hazards and planning appropriate mitigation measures.

With the advent of Satellite Remote Sensing and GIS technology, the information generation related to earth surface has become easier in terms of database generation, storage, retrieval and data analysis. Further, creation of computerized database with Net-working facilities has added a new dimension to the dissemination of information, free flow of data and information exchange for speedy implementation of action plans and their monitoring.

The computerized data constitutes a comprehensive digital database. The database contains information about various resources fields such as land, water, vegetation and socio-economic situation, which can be potentially tapped as per needs to create information system such as Land Information System (LIS), Water Information System (WIS), Forest Information System (FIS) and Disaster Management Information System (DMIS)... Thus a digital base generated under GIS environment can find applications in various fields related to natural resources viz. land, water, vegetation / forest, minerals, urban and rural development and specific area necessitating management of natural / anthropogenic hazards, development and management of facilities, transport, etc.

This database under the GIS environment has the following advantages with reference to hazards/calamities:

1. Assessment of the situation through integrated analysis;
2. Implication of hazards in terms of risks and planning;
3. Spatial modelling, querying and map creation for efficient and effective implementation of Response Action System (RAS);
4. Simulation of models and visualization of varying scenarios of hazards.

### *Disaster Management Information System (DMIS)*

Having a digital database under GIS environment is oriented towards providing information for decision makers and encompasses information on natural resources. The integration of these data sets would aid in decision making process for systematic planning and management of resources as well as disaster situations.

A wide variety of maps are required in the study of hazards. The maps generated would furnish information on political boundaries, transport network, settlements and natural resources set up on which the spatial aspects of hazards can be represented. These maps furnish basic location information concerning hazards with thematic support maps such as tectonic features, geological features, landforms, drainage, land use / land cover and soils. The information provided by the thematic maps are as follows:

1. Geological maps help to identify the earth materials, geological hazards (e.g. seismic landslides,.) and river courses;
2. Geomorphology maps are helpful in creating an integrated picture of the natural land surfaces and its hazards (erosion, floods, landslides, subsidence and so on). Those maps form a part of a wider endeavour to understand the sensitiveness of geomorphologic processes to human interferences and the risks associated with development and settlements of hazardous sites.
3. Soil maps depict the variation and changes in soil characteristics. Specialized pedagogical maps with collateral data enable area specific prediction such as landslides and mass washing, epidemic surveillance of soil borne diseases etc. They also help in providing information on drainage, water logging and erosion susceptibility.
4. Land use / land cover maps depict the land use pattern such as

animal, forest, scrub land, etc. These maps can be used for assessing the extent of damage as a consequence of hazards / disasters and valuation and also identifies the areas prone to hazards like floods, forest and fires.

5. In addition to the above, many other types of thematic maps that have direct or indirect bearing to hazards would also form a part of the RIS.

The socio-economic and infrastructure data that reside in the database would be useful in the analyses of growth trends, demographic situations, the consequences of hazards depending on the demographic pattern, economic profiles, infrastructure status, communication networks, linkages and so on. Recognizing the utility of Remote Sensing and Geographic Information System (GIS) in data collection, formatting storage, manipulation, transmission, updating analysis and query development and network/communication linkages, in the Islamic Republic of Iran, IRIMO, developed a comprehensive Disaster Management Information System (DMIS) to meet the following objectives:

1. To create digital database comprising of both spatial and non-spatial data for identifying disaster prone areas;
2. To assess disaster situation through integrated analysis;
3. To organize response emergency operation through better information flow;
4. To utilize the GIS data base for designing and implementing the mitigation and preparedness measure;
5. To derive additional benefits of utilizing the resources data base for developing planning at the district/region and state level.

The primary objective to carry out integrated analysis of spatial and non-spatial data and generation of hazard maps relevant to the districts in Iran such as drought, floods epidemics, earthquakes, accidents, industrial hazards, fire, and cyclones. The created data base will be immensely useful in the development of Vulnerability Analysis System (VAS) and Response / Action

Plan System (RAS). Disaster information user needs very greatly. The number of interested people, educational institutions, organizations and local community users are growing, as are relevant websites, networks, and multidisciplinary and professional exchanges. Some users require highly processed data, while for others raw data is more useful. In any case, the importance of adequate training, and an appreciation of the quality of the data, for any user of disaster information is clear. This information is disseminated in two methods; such as; public and special. Main users of this information are the Ministry of Power, Ministry of Agriculture and the Meteorological Organisation. A particularly valuable role of private organizations is the dissemination of disaster information, especially the delivery of such information to the general public to minimize losses.

#### **4.2 Academic and research communities linked to national or local institutions dealing with disaster reduction**

In the Islamic Republic of Iran, some academic and research communities and institutes, belonging to the Ministry of Science, Research, and Technology, Ministry of Interior, Ministry of Power, Ministry of Road and Transportation, Ministry of Jihad-e-Agriculture carry out study and research about different types of disasters. For example, research centres belonging to IRIMO are as follows:

1. Atmospheric Science and Meteorological Research Centre (ASMERC);
2. National Centre for Climatologic (including Climatologically Research Institute (CRI);
3. Oceanic Atmospheric Science Centre (OASC);
4. Atmospheric Chemistry, Ozone and Air Pollution Research Centre (ACOAPRC).

It should be emphasizes that among the above mentioned research centres, CRI were established with three research groups in the Khorasan province in 2001. One of the CRI'S research groups (climatology of natural disaster) is especially for study and risk reduction of natural disasters.

#### **4.3 Educational programs on disaster risk reduction in public school system**

The teachers and educators concerned with most types of hazards, because of their situation in the community and their interaction with children

and parents, play a very important role in disaster planning, preparedness and education. Also, teachers can play a very important role in reducing the adverse impact of disasters and assist in post disaster recovery. They can be very effective in such efforts by educating students on the perils of natural hazards, and by preparing them on what course of action to take when a particular disaster strikes.

The most important activities in IRIMO related to disaster risk reduction education are as follows:

1. To hold a number of workshop;
2. To hold the short, middle, and long term training course;
3. To publish books, CDs, posters;
4. To produce training movies;
5. To hold special fairs about disasters;
6. To hold different seminars and conferences about disaster, scientific and technical cooperation with other organization in this field;
7. To keep a close communication with other higher education centres and universities related to atmospheric and climatic hazards and disasters;
8. To exchange special information to teachers and students in public schools, about atmospheric and climatic hazards and disasters;
9. Inclusion of the disaster reduction priority in IRIMO advertisement policies;
10. Inclusion of the concepts of climatic and atmospheric disasters in damage reduction strategies;
11. Improving the training courses for employees related to climatic and atmospheric disaster.

#### **4.4 Training programs on risks reduction**

*Meteorological report:*

The Thirteenth Congress endorsed the views of the Executive Council regarding the need for a worldwide survey of Members' training requirements in Meteorology and Operational Hydrology during the thirteenth financial period (1999-2003) and felt that results of the survey constitute a useful source of information for a number of users. It also agreed that it would be necessary to attract financial, manpower or other resources to enable the various identified training requirements to be met and approved the inclusion of a relevant project in the WMO Fifth Long-term Plan, Chapter 6, section 6.6, Education and Training.

In consultation with the Executive Council Panel of Experts on Education and Training, an updated questionnaire for the fifth world-wide survey on current and future training requirements capabilities and opportunities of Members was prepared, taking into consideration the recommendations of EC-LIII to pay more attention to the expected use of the information, particularly in the decision-making process, due consideration was also given to the new WMO classification of personnel in meteorology and operational hydrology.

*Questionnaire Structure:*

The Questionnaire on Members Training Requirements, Opportunities, and Capabilities was distributed to Members (the Permanent Representatives of Member countries with WMO) by the Education and Training Department on 10<sup>th</sup> April 2002 with a request to return the completed Questionnaire by 1<sup>st</sup> July 2002.

The questionnaire embodies relevant explanatory information on its use and requires answers in the form of crosses (x) in boxes next to the questions, or words/numbers to be entered in the forms provided. The provision of comments or remarks on additional pages is also encouraged. Its structure is as follows:

- Current status of national education and training in meteorology and operational hydrology;
- Human resources development - assessment and plans;
- Assessment of WMO training activities;
- Future education and training requirements, opportunities, and capabilities.

EC-LIII (June 2001) confined that the global survey of Members' training requirements represents an objective basis for its proper assessment and planning of the WMO training activities and for introducing modifications and improvements to the Education and Training Programme.

In this context, the Council urged Members to participate actively in the fifth survey by completing the questionnaire with all the required information. In an effort to ensure a representative global sampling, reminders and then urgent reminders were sent and subsequently, the deadline was expanded, first to 15<sup>th</sup> August 2002, and later to 15<sup>th</sup> October 2002. The number of responses received by 15<sup>th</sup> October was 100 and included the analyses for this document. Four replies were received later and due to technical reasons were not possible to be included in the analysis.

An assessment of Members' replies made in this Technical Document consists of four core chapters organized according to the main four questions in the survey questionnaire.

Member countries of WMO includes 100 countries, that are divided into 6 Regions (I, II, III, IV, V, VI) and the Islamic Republic of Iran is a member of RAII. In general, the quality of responses was good. The following remarks were noticed:

- Low percentage of responses came from regions where intonation is needed;
- Some responses include inconsistency in the intonation, which imply uncertainty of data;
- Some countries did not respond to certain sections of the questionnaire, the reason may be that they did not have national activities pertaining to the particular sections or they may not have the data;
- Although responses from RA I & RA IV were low, they are fairly distributed over the Region.

#### **4.5 Traditional indigenous knowledge which is used in disaster risk reduction**

In the following cases, traditional knowledge is evaluated. In addition to modern technologies, we apply these to disaster risk reduction:

- Using of plants and trees as a shelter against the wind and storm in the farms;
- Using of Qanat as a traditional water system with very low risk;
- To constrict a number of dams;
- Oil mulching as a fixate of running sands;
- Using of water reservoir in past and present;
- Using of medical plants.

#### **4.6 National public awareness programmes on disaster risk reduction**

In the Islamic Republic of Iran there are several types of national public awareness programmes. Public awareness programmes on disaster risk reduction are examples of efforts made by Iran in recent years. The promotion of public awareness about hazards and the creation of widespread understanding about disaster reduction have always been recognized crucial function of the Islamic Republic of Iran's disaster risk management strategies which have a proper agreement with Yokohama strategy.

Some of the national public awareness programmes in Iran are as follows:

1. Apply Information Technology to have good national public awareness programmes on disaster risk reduction;
2. Establish a special website about climatic and atmospheric disasters; there are disasters identification and disasters reduce methods, in this site; (See [www.irimo.ir](http://www.irimo.ir));
3. Preparing the films in regard to the risk identification and risk reduction;
4. Preparing some texts and papers for the magazines and newspapers;
5. Make some facilities for ordinary people to visit the research centres;
6. Development and optimization of the advertisement activities;

7. IRIMO and air quality control company play an important role in the field of air pollution and also promoting public awareness in this field through website (<http://aqcc.org/tehran.air.htm>) which show the air quality;
8. Public education by experts;
9. To hold several workshops, and conferences;
10. To publish technical reports and scientific books.

## **5. Risk Management Applications/Instruments**

### **5.1 Environmental management and risk reduction**

In the Islamic Republic of Iran there are several different usage types of environmental management and risk reduction practices in operation. Environment protection and environmental programs are most important and are a high priority in the country. In the future, 20% of the integrated plan of the country will be based on environment management.

For example, forest keeping is one of the priority of environment management. 7% of Iran is forest, keeping this amount and forest expanding is important.

Unfortunately forest mismanagement in Iran, especially in Golestan forest, caused several devastating floods. Therefore, some efforts have been made by the relevant authorities to increase the active involvement of local communities through approaches and suitable community models. These efforts were supported by international assistance in several countries.

After this destructive flood (Golestan), the government approved the integrated plan of worth forests protection in 2003 in five sectors as follows:

1. Classification of duties in different management levels of north forests of the country;
2. Policies and Performa's actions for protect the north forests of the country.
3. Operational manners for revival and development of vegetations;
4. Optimum of the usage of resources and correction of operational and technical methods;
5. Monitoring and assessment of operational efforts in the north forests of the country.

In addition, combating desertification is one of the priorities. The Islamic Republic of Iran has allocated significant resources to desertification control activities in more than 4 million hectares over the past few years, and plans to address another 10 million hectares in the next five years- It has established a National Committee to combat Desertification to formulate a national programme of action. The country has opened a local office of the network of

research and training centres on desertification control in Asia and the Pacific. With support from the International Fund for Agriculture Development (IFAD) and the office of the United Nations High Commissioner for Refugees (UNHCR), the Government has also rehabilitated 140,000 hectares of range lands degraded by refugees.

The planting of plants suitable for dry regions, in the deserts of south Khorasan, Yazd and Kerman has meant that desertification in these places has been limited over the past thirty years.

## **5.2 Financial instruments utilized to reduce the impact of disasters**

There are successful and active, financial instruments which are utilized in the Islamic Republic of Iran as a measure to reduce the impacts of disasters.

In Iran, damage assessments are carried out in three ways:

1. Insurance industry of the country such as insurance box of agriculture products. They apply disaster assessment based on the IRIMO's disaster Information. This kind of insurance assesses risk before necessary agriculture warning of the Islamic Republic of Iran Meteorology Organization and damage after the disaster and pay the damage cost in commitment framework. For example; there are special aids for drought, hail, storm crash, chilling and frost;
2. Management and Planning Organization of Iran pay the damage cost to some Ministries such as Ministry of Interior, where it will appear as support for the area.
  - a. In this regard, the type of agricultural products covered by this type of insurance are as follows:

Wheat, barley, colza rape, safflower, chick-pea, lentil lens, bean, rice, cotton, beet beetroot, potato, onion, flint corn, field corn, sunflower, saffron, almond, pistachio, grape, apple, grenade pomegranate, walnut, water, dryland
  - b. Hazards covered by insurance are as follows:

Flood, hail, heavy rainfall, frost and chilling, earthquake, storm, drought, spring cold temperature
3. In regard to other types of disaster such as earthquake, aircraft accident, forest fire, there are some active private insurance

companies in Iran.

### **5.3 Technical measures or programmes on disaster risk reduction**

Measures taken to reduce the effects of natural disasters regarding the following points such as

- a. the vast extent of the land of Islamic Republic of Iran;
- b. land –use planning;
- c. optimum use of water resources;
- d. forests management and building regulation

are in general long term plans. Such measures are taken by risk management for different parts of the country based on their related priority and requirements involved.

In order to cover all necessary measures required for natural disaster reduction, the following programs and steps are planned:

#### ***Floods***

To reduce the effects of floods, a series of executive and study plans for execution in critical areas are planned but due to the extent of the areas normally under the flood damages in the country, these plans are in their preliminary stages.

These plans and measures are directed along three main axes:

- 1- Basic studies and flooding potential of country;
- 2- Engineering and biological plan required for damage reduction purposes;
- 3- Flood management (which is executed).

Detection of flood prone areas using GIS and RS Technology and zoning maps has been derived. Establishing early warning system for flood occurrence along the rivers and basin areas in flood prone region and flood predicting using numerical runoff model have been carried out.

#### ***Drought***

Using GIS, Satellite Data, Early Warning System, NDVI, SPI and other Indices using the output of global numerical long-term prediction model which is running and executing in international climatic prediction centre to monitor and forecast drought.

### ***Earthquakes***

- 1- Completion of seismological and accelerogram networks of the country;
- 2- Preparation of accurate seismic hazard maps of the country;
- 3- Seismic micro-zonation and detail study of densely populated areas and large cities of the country;
- 4- Calculation of soil and foundation amplification factors on earthquake acceleration;
- 5- Attenuation acceleration estimation and evaluation of other ground movement parameters in different parts of the country;
- 6- Modification and completion of existing regulation;
- 7- Extension of public training and promotion of knowledge of seismology and its related fields;
- 8- Implementation of a systematic data networks related to the technical specification of seismic data of the country;
- 9- Organization of a special institution to approved rescue and reliefs;
- 10- Preparation of a comprehensive model for reconstruction, compatible with different geographical and seasonal conditions present in different parts of the country and required for execution of regulation provide for reconstruction plans in devastated areas;
- 11- Evaluation of liquefaction potentials in different part of the country and its related zoning;
- 12- Survey and evaluation of landslides of the country and preparation of an appropriate methodology for its application in the form of regulatory documents;
- 13- Preparation of landslide zonation map of the country.

## **6. Preparedness and Contingency Planning**

### **6.1 Disaster contingency plans and their preparation at national and community levels**

There is an integrated rescue and relief plan in I. R. of Iran. The plan covers national and local levels.

### **6.2 Emergency funds for disaster response and national storage facilities for emergency relief**

In the Islamic Republic of Iran, a part of the total annual budget is saved for emergency funds for disaster response.

In addition, there is national and community level support for providing food, medicine and tents and shelters for post disaster actions. It should be noted that in severe disaster situations, there are some difficulties and serious problems. The Bam earthquake shows that international cooperation and support is needed. When disasters strike the government tries to provide some special support as well as community level support for disaster relief and rescue.

### **6.3 Major coordinator for disaster response preparedness and available resources**

In the Islamic Republic of Iran, the Ministry of Interior in the framework of the integrated rescue and relief plan has been legally assigned to function as the coordinator of disaster response preparedness and also activities related to the immunization and prevention of life and property losses. The Ministry of Interior is in charge of the integrated rescue and relief plan.

Regarding human resources for the coordination of disaster response preparedness it should be noted that the situation for volunteers and NGOs is positive. As far as experts are concerned there is some deficiency and we need to promote the level of technical and special knowledge of executive authorities and decision makers in different provinces of the country.

Concerning financial resources for small and local scale disasters there is no problem. For large and national scale impacts of disasters, the financial resources are lacking.

## 7. Good practices in disaster risk management

### *Case study 1:*

In the Islamic Republic of Iran, different types of natural disasters occur, such as droughts, floods, earthquakes, sea-level rise, dust storms, hail and freezing. Flood hazards and disasters are one of the most frequent and damaging types of natural disasters. They have been the most common types of geophysical disaster in the latter half of the twentieth century in Iran, generating an estimated 20 percent of all disasters from 1950 to 2003. Such a flood occurred in Golestan and north of Khorasan province, located in the north-east of the country, in August 2002. According to the Islamic Republic of Iran Meteorological Organization (IRIMO), the early warning issue of the mentioned flood was issued 48 hours in advance. Studies show that not only frequency but also intensity of floods have increased during recent years. The analysis and response to flood risk needs to be integrated in a systemic manner: that is to say, in a manner that recognizes all the factors present in natural hazard systems and their interactions. In our country a guideline for integrated flood risk management has been established. It covers land-use regulation; the integration of structural and non-structural measures; the integration of flood risk management plans with related plans; and recommendations on interprovincial cooperation on flood risk management. Based on the above-mentioned components, the National Flood Early Warning System in I.R. of Iran (NFEWSI) has been designed and introduced to the government, by IRIMO (2001) and the Climatological Research Institute (CRI, 2001) has been in operation since 2000. The NFEWSI consists of three main parts:

1. Observation;
2. Forecast and Warning Issue;
3. Response.

The use of this early warning system, focusing on Golestan province and north of Khorasan, meant that the impact of the flood was lessened and less damages was caused to buildings and Agriculture.

### ***Case study 2:***

A further instance of disaster risk management is the Drought monitoring and early warning system in the I. R. of Iran. We know, that most parts of Iran have a high degree of aridity and pronounced rainfall variability in large parts of their territories and are therefore highly vulnerable to drought. Therefore, drought is one of greatest natural disasters in our country. Among all natural disasters, droughts occur the most frequently, have the longest duration, cover the largest area, and cause the greatest losses in: agricultural productions. The quantification of impacts and the provision of disaster relief are far more difficult tasks for drought than they are for other natural hazards. Since, drought is a normal part of climate, it is difficult to determine its onset, development, and end. This fact emphasizes the importance of developing comprehensive monitoring or early warning systems. Drought prediction (monthly, seasonal, or annual trends) is particularly useful for drought planning and mitigation. Drought Early Warning System has been applied as a pilot study during the last two years. The NDEWSI (National Drought Early Warning System in Iran) is based on the monitoring drought indices, such as SPI, Palmer and NDVI, and preparedness. It is our view that development of a drought monitoring system based largely on meteorological and climatic information could be a great help for early assessment of drought impacts in Iran. In this sense, the SPI could be a valuable tool for monitoring climatic conditions, particularly in drought-prone areas of the country. Assessing risk of drought is a first step in this direction. Whether the desert is expanding or not, there is agreement that patterns of vegetative cover in all areas of Iran are dependent on rainfall, with the exception of some irrigated areas. In most of the areas, rainfall is the key limiting factor in crop and rangelands production. The methodology, which is employed during recent years in our country, is based on the relationship between remote sensed data about vegetation, in the form of vegetation index, and rainfall. The research examines the implications of the results for operational drought risk monitoring. This study also concludes that remote sensing is one feasible data source for the information system necessary for drought monitoring. Using this monitoring and early warning system for drought in some provinces such as north of Khorasan, we have been able to reduce many losses in agricultural sectors.

## **8. Priorities of Iran on Disaster Reduction**

1. Promoting all types of disaster risk management at national and community levels;
2. Establishing regional specialized disaster risk reduction centres;
3. Development of national and local risk mitigation strategies;
4. Comprehensive assessment of hazards and vulnerability;
5. Enhancing disaster communication, early warning system and information exchange;
6. Capacity building and developing international networks and cooperation on disaster reduction;
7. Integrated analysis of risk;
8. Evaluation and assessment of damages;
9. Selection and integration of structural and non-structural measures;
10. Land-use regulations;
11. Environmental impact assessment;
12. Development and Implementation of hazard management plans;
13. Integration between nations and exchange information;
14. Promotion of disasters research education and public awareness;
15. Promotion of related knowledge and technology of natural disasters risk reduction.

# Chapter 4

## **The Broad Plan for Local NGO Cooperation Bam Earthquake**

### **1. The Kerman NGO Network**

#### **Kerman NGO House**

#### **Support and Assistance from Hamyaran Iran NGO Resource Centre**

### **1.1 Background**

On 26<sup>th</sup> December 2003, an earthquake measuring 6.5 on the Richter scale struck the city of Bam and its surrounding areas in the Kerman Province. In the first week over 30,000 people were reported dead, while the list of those injured and/or homeless rose at a breathtaking pace, tapering off at some 85, 000 citizens homeless or misplaced.

Additionally, 85% of the city has been severely damaged or destroyed, leaving the major city centre uninhabitable. Electricity, water distribution, and sanitation services were significantly affected or destroyed, while all major static health services were irreparably damaged.

The historical significance of the Arg-e-Bam, the ancient citadel located within the city, cannot be over emphasized. As a result of the quake it has been almost completely destroyed, along with the majority of the area's economic prospects and the community's general livelihood, both in agriculture and tourism.

### **1.2 Users of the NGO Initiative Broad Plan**

This plan is the Broad Plan of the Kerman Non-Governmental Organization (NGO) Network, the Kerman NGO House, with technical support and assistance from the Hamyaran Iran NGO Resource Centre. The plan is directed towards Iranians and Iranian institutions both at home and abroad, international civil society, and the local and international business community. It is to be used as a broad outline of recognized needs and suggested responses as assessed by the local civil society community within the affected area.

Based on the Plan a number of interventions have been developed and translated into action with the help of local people, expatriate Iranians and with the support of a number of international NGOs.

### **1.3 Overall Aims and Motivation for Action**

The response of the Iranian civil society sectors, specifically the non-governmental organizations (NGOs), in the disaster management and preparedness phases is motivated by the commitment of community organizations to addressing the needs of the affected persons and region. Ultimately, the motivation behind planning and action is driven by the urge to aid in the communal process of healing through the strengthening of community resources, capacity, and capability to cope and recover.

The principle behind mid and long-term reconstruction is the empowerment of the community. After a major, debilitating emergency the community is forced to rely on the skills and aid of the government and international aid organizations. In time, however, the attention of the international community will shift. If the stricken region is not prepared for this eventuality and does not possess the coping skills to sustain their own momentum for recovery, it may be caught in a potentially dangerous and vulnerable situation.

The intention of the Kerman NGO Network, Kerman NGO's House, is to keep the majority of the mid and long-term recovery and reconstruction efforts in Bam community-based. These efforts include needs assessment and synthesis of project planning and program implementation. It is the participation of those at the local level that will ensure the success and effectiveness of most of the proposed plans of action. Furthermore, through their partnership there will be firm steps towards psychological, physical, and economic recovery in the stricken community of Bam.

The principles for international and local NGO cooperation are facilitation of partnership between international non-governmental organizations (INGOs) and Iranian NGOs in long-term recovery; establishing a direct link between INGOs and the stakeholders on the scene in Bam; ensuring that assistance reaches target groups in a timely and effective manner; and, finally, promoting participatory and transparent cooperation.

It is hoped that through partnership with the broader civil society and non-governmental network, we can further develop our own structures for preparedness.

## **2. Analysis of the Role of Local Non-Governmental Civil Society as outlined in the UN Flash Appeal**

The UN Flash Appeal for the Bam Earthquake focused on the first 90 days of the relief and recovery periods. Although the mandate of the United Nations states a close working relationship with non-governmental organizations, and the Appeal itself states, *“It is important that the UN agencies identify the most strategic areas of support and work in close partnership with their provincial and national counterparts”* it should be noted that local and national NGOs can also act as viable partners in aiding the region into recovery, reconstruction, and sustained development.

At the outset of the twelve programs and projects outlined in the appeal only three directly address NGOs as partners for implementation. Of these, none specify if the non-governmental implementing partners would be local NGOs. No project outlined identified Iranian civil society as a partner for planning, development, or monitoring.

Through a lobbying process the local NGOs managed to place themselves on the map as an important partner. A rapid needs assessment was undertaken at the end of last year, organized by local NGOs with participation of the local government in Kerman, UN agencies, representatives of the Bam local councils and the private sector (including the Kerman and Tehran Chamber of Commerce). Over the past few months NGOs and CBOs, particularly from Bam and Kerman have been invited to government and UN consultation meetings.

### **3. The Broad Plan for Assistance**

The Kerman NGOs have focused on eight broad categories for local NGO action in the immediate, mid, and long-term phases of disaster management. These are listed below:

1. Planning, Coordination, and Management;
2. Local NGO Capacity Building;
3. Housing and Reconstruction;
4. Employment Generation and Economic Activities;
5. Health Sector Reconstruction;
6. Education and Social Services;
7. Environmental sustainability;
8. Synthesis of All Needs Assessment.

#### 4. Planning, Coordination, and Management

There are over one hundred active NGOs in Kerman City, the majority of which are members of the Kerman NGOs Network that has been responding to the rising pressures and needs of the affected area since the first day of the disaster. The leadership of this unit has great credibility within the local community, as well as with the business, governmental, and international sectors.

The day after the earthquake, the Kerman Network mobilized into a disaster management unit. As such, they have created six clusters, or focal groups, to address the immediate needs of the community. These clusters focus on the environment, women, children, youth, reconstruction, and urban planning.

In order to plan, coordinate, and manage effectively on the field, members of the community must be involved in order to share information and communicate their pressing and impending needs voluntarily. This network is one that is firmly embedded and trusted by all sectors of the community, thereby having greater access and mobility than their international or even national counterparts.

##### *Ideas for Action<sup>4</sup>: Planning, Coordination, and Management*

##### *A. Develop Protocol between Kerman NGOs and International Civil Society Counterparts; Framework for Relations between Local NGOs and International Donors:*

##### *General Objective*

In order to create and maintain mutually beneficial and positive relations with sectors of international civil society, a system of cooperation must be developed to streamline efforts and increase efficiency while organizing coordination efforts. The Disaster Management Network in Kerman, with help and advice from national and international NGO representatives, will develop a protocol for overall international cooperation.

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<sup>4</sup> The Ideas for Action are based on the meeting between the German Federal Agency for Technical Relief (THW) and the Kerman NGO's House. These actions are in the proposal stage. They are meant to suggest basic options for civil partnership and not to dissuade creativity in the rehabilitation projects. Donors are in no way bound to these formulas.

### Operational Objectives

Operational objectives for the creation of an effective international cooperation protocol:

1. The local NGO network must assess their internal needs and the necessary international cooperation and assistance;
2. Through their advisory roles, representatives from the national and the international civil society community should assist in the drafting of the protocol;
3. The protocol should be reviewed and approved by the appropriate governmental bodies;
4. The appropriate participants should sign the protocol as soon as possible.

### Strategy

Through articulation of the expectation, goals, and roles of the local, national, and international organizations, firm steps will follow and precedent will be set in coping and recovering from future disasters. Furthermore, through this protocol the relationship articulated will be the framework for international cooperation and presence in less severe emergency situations.

## **5. Protocol for International Cooperation:**

1. Each program package or project proposal must be developed through a consultative process with the Kerman NGO Network, the Kerman NGO's House, and the relevant international donors.
  - a. All program and/or project proposals should be flexible taking in to consideration the rapid changes in the disaster management situation;
  - b. The proposals must be endorsed by the Disaster Management Task Force, the Governor of Kerman and through the facilitation of the Kerman NGO House;
  - c. The proposals should be developed through an equal partnership between the Kerman NGO's House and the International Donors.
2. The projects/programs should be developed based on the comparative advantages and specializations of the local and the international organizations;
3. The projects/programs should be signed by the implementing NGO, the international donor(s), and the chairman of the Kerman NGO's House.;
4. The monitoring of the projects/programs should be the task of the appropriate governmental bodies, donor agencies, and the NGO network.
  - a. All signatories of projects/programs must be open to monitoring;
  - b. All program agreements must be copied to the Office of the Governor-General of Kerman Province and shared with the Ministry of Foreign Affairs.
5. Progress Reports should be regularly prepared and given to the Kerman NGO House, the international donors, and the appropriate governmental bodies.
6. All the aforementioned steps must be executed with transparency and accountability.

The protocol was drafted and reviewed in a number of consultation meetings held in Kerman. It has the blessings of the local government authorities and has been used in drafting and signing agreements between local and international NGOs.

## **6. Local NGO Capacity Building:**

It is the inability of a disaster-stricken society to cope with the gravity of loss and damage that transforms natural disasters into emergencies. Therefore, in order to ensure that the mechanisms to cope are developed and secure, one major objective must be the capacity building of local NGOs. It is through specific, creative training of trainers (TOT) programs; in partnership with international relief and recovery organizations that the coping ability of the NGOs will increase. Furthermore, it will increase the ability of the community at large to cope with the growing needs of the region. Local Capacity Building will also aid in the structuring of a permanent infrastructure for future emergency preparedness.

### Ideas for Action: Local NGO Capacity Building

- A. Providing the Secretariat of the Kerman NGO House (NGOs Network) with the Appropriate Technical Equipment

### General Objective

In order for the local NGO community in the affected communities to have the necessary technical capacity to respond to the demands of the later phases of disaster management, and for the organizations to be better prepared in case of future emergencies, technical equipment such as computers, digital cameras, multi-media projectors, copy machines, and printers must be available on a permanent basis.

### Operational Objectives

The main operational objectives for the technical program are as follows:

1. An assessment of the needs of the NGO community must be conducted with a focus on increasing the technical capacity;
2. Following this a list of the necessary equipment will be provided to donor agencies, such as the German agency THW, along with other relevant organizations;
3. Appropriate trainings for the TOTs will be provided through donors like GTZ, etc.

### Strategy

The poor technical capability and capacity of the local responders will prove detrimental in the months of recovery that will follow. Through a thorough assessment of present capacity and by addressing the shortcomings, a strengthening of the nongovernmental bodies will certainly follow, allowing the entire community a greater and more efficient plan of action and preparedness. By bringing in equipment and trainers, the community action will become stronger and more unified.

### Indicators

1. The number of computers, etc. in relation to the number of NGOs in the network;
  2. The number of trainings that will held by donors;
  3. The number of computer literate persons in the local NGO network;
  4. Continuing refresher trainings
- B. An Experienced Consultant to Advise Local NGOs in Kerman

### General Objective

In order to increase the effectiveness and efficiency of the primary responders in the region, an international civil society representative should be brought in to improve the skills of the local non-governmental bodies.

### Operational Objectives

The operational objectives of the consultant project are:

1. To increase the skills of the local non-governmental community, especially in the facilitation of international cooperation;
2. The consultant will also help with the development of good management by planning and assisting in the implementation of a monitoring system to track the performance of projects;

3. The implementing agency must facilitate visas and accommodation for the advisor; as well as the visa and accommodation needs of two other NGO representatives from Germany who have agreed to cooperate as advisors.

### Strategy

The partnership of the consultant with the community NGO network will be another step in strengthening the coping mechanism, and, by extension, the preparedness of the community. Through the support of advisors from strong NGO communities in countries like Germany and Great Britain, the programs to increase capacity will become community-based, gaining strength from the experiences of international donors.

### Indicators

1. Formulation of a management plan;
2. Creation and implementation of a monitoring system;
3. Better performance in response interventions.

For capacity building two project agreements have been signed involving the Kerman NGO House and Hamyaran on one hand and Malteser (German NGO) and the Save the Children Alliance on the other.

So far six workshops have been held based on needs assessments. The first was carried out with support of UNDP and the Ministry of Interior. A resource person from GTZ, was the principle trainer. Two workshops on project proposal writing was funded by Malteser with training inputs from OXFAM and three back to back workshops targeting local NGOs active in providing support and protection services to child earthquake victims were supported by Save the Children, with funding from ECHO. UNICEF provided resource person support.

### C. *Facilitating the Exchange of Experiences between Local NGOs and their International Counterparts*

### General Objective

One of the main objectives of any recovery operation is the participation of the local community. Thus it is the local NGOs who have the

established relationships, credibility, and cultural sensitivity to successfully implement projects and programs for recovery and preparedness. It is through the experiences, successes, and mistakes made by other countries, coupled with the specific experiences of this particular country that will allow the local NGOs to develop appropriate programs and gain the necessary skills through trainings and workshops.

### Operational Objectives

The main operational objectives of the exchange of experiences response programs are as follows:

1. To assess the needs of the community and the local NGOs at each level of Recovery Management; the local NGO and community capacity, and the partnership capacity of the governmental bodies (i.e. Ministry of Interior) and international organizations (i.e. UNDP);
2. Organize and conduct exchanges and trainings in comparable developing nations, like Turkey, Mexico, and India, as well as developed nations like Japan and the United States; the focus should be on bringing trainers in to Iran;
3. Organize and conduct training programs through larger relief organizations from developed nations such as Germany, the United Kingdom, or organizations like the United Nations and affiliated agencies;
4. The focus of such exchanges and trainings should be good practices in disaster management;
5. Training for youth volunteers through the International Red Cross Tehran Office;
6. One German NGO representative will serve as an advisor on the operational realities and capabilities of NGOs; the outcome will be the development of management coordination plan;
7. Any other relevant training that may prove both useful and necessary to provide an effective recovery period;

8. At the end of three months, there should be a seminar for Bam Disaster Management, Preparedness, and Rehabilitation that pulls together the projects and plans completed or in various stages of execution that have been developed by the local NGOs in partnership with interested international organizations, like GTZ and the Save the Children Alliance, Oxfam, UN agencies.

### Strategy

The trainings, workshops, and other Training of Trainers (TOT) programs should take place within the targeted community so as to reach as many of the local NGOs as possible and only in the host country in cases where this is absolutely necessary for the program's success. The training and workshops should be developed specifically for the particular culture and community in question with a view toward recovery and preparedness.

### Indicators

1. Number of local NGOs based out of Kerman, Bam, etc. that participate in training exchanges;
2. Number of projects and programs that are developed to address the needs of the community through the financial, technical, and educational support of the of the international counterparts;
3. Number of trainers and trained volunteers;
4. Creation of consistent and effective response plans for each sector that suit the capacity and capability of the community, nongovernmental bodies, and local government.

Several consultation meetings were held between local and international NGO representatives. Six international NGO representatives attended the last session of the workshop on proposal writing and provided orientation on how to access their resources. A number of project agreements have been developed and will be implemented soon.

## **7. Temporary Housing and Shelter**

One of the most devastating realities of the Bam Earthquake is the amount of the population that it has left homeless. With 85% of the city destroyed, it has left a disproportionately large amount of the surviving population living in tents and tent cities. Thus, a major need is for temporary and permanent housing to be made available to the populace as soon as possible.

In addition to government sponsored plans a number of international NGOs are negotiating with local NGOs to help construct housing within the government master plan, particularly in nearby devastated villages. At least 500 housing units will be constructed with the participation of the local residents.

## **8. Regeneration of Employment and Economic Activities**

In order to recover from any disaster, one must feel like a part of a community and an economy that is actively regenerating. Therefore, through assistance from the local community, government (especially the Chamber of Commerce) international donors and recovery organizations, measured steps can be taken toward identifying parts of the economy that can be salvaged such as the agricultural fields, as well as creative alternatives for regenerating the job market.

A major employment fund for poor families, female headed households, and unemployed youths will be created based on good practices and international policies. Also, employment programs, like micro-credit and work-for-cash or work-for-food programs, are effective in giving the participants the feeling of partnership with the donor and governmental sectors. Also, it may curb a probable exodus from the quake stricken region. Malteser has signed an agreement with the Kerman NGO House and has provided 77,000 Euros for micro projects targeting poor families. A pilot project for setting up a community chest has been developed by Hamyaran. The initial phases of the project, including choice of site, creation of clusters of families and election of representatives of the cluster families and training of the community-based program managers is to be undertaken by June 2004.

One working example of an effective micro-credit program is the Ardekan Project in the Yazd province. (Please visit website [www.hamyaran.org](http://www.hamyaran.org))

## 9. Health Sector Reconstruction

As with any emergency situation, major sectors of Bam's public infrastructure have been irreparably damaged. The entire health system has been destroyed or severely affected by the quake. This includes the destruction or non-repairable damage to buildings and equipment, as well as a significant loss of life among the medically trained local population.

Among the list of resources destroyed are the 95 community health houses that had been the centre for outreach within the city and its surrounding areas. This coupled with the loss of the 14 rural health centres, 10 urban health centres and two hospitals, as well as the 50% of trained medical workers that are dead or missing has left a palpable lack in the static health infrastructure of the Bam area.

However, the reconstruction of the health sector cannot simply be a physical construction and re-staffing plan. A major mental health and trauma intervention initiative must be implemented in the immediate, mid, and long-term phases of disaster management. Ideally, all projects, from construction to sanitation and education, will be designed, developed, and implemented with a focus on psychosocial recovery. Thus, the close involvement of the community and the non-governmental sector in partnership with other sectors of society will instil a greater sense of ownership and empowerment.

In terms of health and basic standards of health care, the focus should be on assuring at least the basic minimum of 2100 kilocalories per person per day, while acknowledging that the survival minimum for adults is 1000 kilocalories per day. Malnutrition of survivors should be monitored according to the international standards as outlined in the Humanitarian Charter and Minimum Standards in Disaster Response, The Sphere Project.

### Ideas for Action: Health Sector Reconstruction

Projects will be developed in light of the health projects already implemented in Bam and surrounding areas.

Methods for project and program development and implementation must be direct promotion and advocacy, along with consistent follow-up from the preliminary through to the completion phases of the project.

### Strategy

In keeping with the community-based view of recovery, needs must be identified and articulated by the appropriate local bodies in partnership with outside organizations before any action should take place. Through the formation of a strong, enthusiastic, and knowledgeable consortium of non-governmental, governmental, and international actors, an effective community driven analysis of need and response can take place.

## 10. Education and Social Services

A major casualty of the earthquake was Bam's education and social service infrastructure. A majority of the trained educators are dead, missing, or injured. Indeed, the trauma of the surviving teachers may be so severe that their ability to teach effectively and without further contributing to the trauma of the students is challenged. Thus, when considering both the psychosocial well being and rehabilitation of the victims, projects and programs must be geared towards the recovery of both students and teachers.

In terms of physical needs, 131 schools in Bam and many more in the surrounding areas have been destroyed. The rebuilding of the schools and social centres, centres for the community to congregate and seek help or comfort, must have a two-pronged objective. One is the timely building of safe, quakeproof buildings. The other is the participation of the community in the planning and rebuilding process.

### Ideas for Action: Education and Social Services

#### 1. Reconstruction of the Health Centres, Social Centres, Rehabilitation Centres, and Schools

##### General Objectives

In order to directly address the psychosocial repercussions of this catastrophe, the public infrastructure must be repaired or rebuilt through a participatory approach. It is acknowledged that shelter is not only a place where people are housed, but also an area where personal safety is ensured, thereby increasing a feeling of security and normality. The construction of social centres and schools occurring concurrently with the rebuilding of homes and health centres will encourage feelings of progress and recovery, while also allowing safe places for the people to congregate, socialize, and learn.

##### Operational Objectives

The operational objectives of the reconstruction program:

1. The list of centres and schools to be constructed will be developed by the local organizations and the international donors with awareness of need, availability of materials, and local capacity;

2. List of immediate needs for rehabilitation and counselling equipment;
3. Literature on Good Practices, as well as learning from the mistakes of past disaster management projects, will assist in the planning and organization of projects;
4. Master plan that articulates NGO roles in reconstruction should be developed and formulated from the local level;
5. Cooperation and recruitment of planners, designers, and builders from community organizations, such as the Philanthropic Association of School Builders;
6. Plans for maintaining and monitoring the effectiveness of the centres and schools; including necessary training and refresher courses for staff.

An NGO Project Agreement between Malteser Hilfdienst e.V. Foreign Aid Department and Kerman NGO's House for Temporary School Units (Conex) in Bam, Kerman Province has been signed and several schools have become operational under this agreement.

Several national NGOs such as the Society for the Protection of Socially Disadvantaged (SPASDI) working on disabled and disadvantaged, women NGOs have been very active in supporting poor and deprived families and charity-based NGOs, very active in the relief phase are all working in Bam. The Science and Arts Foundation has set up IT classes in many of the schools that have become operational. Vulnerable women and female-headed households are receiving priority attention from local and international NGOs.

Most of the volunteer groups are made up of women, especially younger women. Thus the local response has a natural strong gender dimension. This is also seen in the training workshops that have been undertaken. More than 80 per cent of participants are young women.

Tehran-based and Kerman and Bam Child NGOs with support of local people have been present in Bam from the first days of the earthquake. Some of the active NGOs include Kerman Child Friendly NGO, NGO for Street and Working Children, Donya, the Children's Book Council, Today's Mothers, NGO for Protection of Child Rights. Setade Yari Rasani be Koodakan Bam (Bam Children's Support Center Seeb), Maahak, Pooya.

## **11. Environmental Sustainability**

After major natural disasters, major damage to the region is sustained leaving the surroundings exposed or susceptible to environmental hazards such as gas leaks, water contamination, etc. The Kerman NGO Network's environmental working group is working in conjunction with over forty major national environmental NGOs to develop a plan for post-relief environmental intervention to be implemented throughout the coming months.

The environmental NGO network will be concentrating on issues surrounding sanitation and contamination, as well as campaigns focused on public safety and awareness. In order for the effective implementation and development of projects, the network will welcome international collaboration and information sharing.

The Youth NGO network of Kerman has drawn on the help of national youth NGOs to carry out a number of cultural, sports and creational activities.

## **12. Synthesis of Needs Assessment**

From the first day of the earthquake, needs assessment and situation analysis teams from various organizations, governmental departments and UN agencies descended on the region, gathering first hand data and testimonials from the population. However, because of the scale and scope of the damage, as well as the amount of assisting organizations that are in the region, there has been no organized method of compiling the information gathered. In order to assess what needs to be accomplished, as well as what has been completed, at every phase of recovery, there must be a system in place that will allow reflection on the progress and failures of the programs. A needs assessment synthesis will be a necessary part of the foundation for monitoring the practice of disaster management from the first days through to the last.

### **13. Future Outlook**

A team of NGOs from different disciplines together with representatives of the private sector have got together and formed an informal coalition called Shahab, Crisis Control Council to cope with all kinds of disaster.

Efforts are underway to form a partnership of local and international NGOs, the private sector and the Government at the levels of Bam, Kerman and Tehran.

The Iranian Diaspora is to be brought into the local plan for addressing the marginal groups and ensuring participation of the citizens of Bam in their future development. This is to be a civil society initiative inviting the government and the UN to join.

The Gender dimension will be mainstreamed in all activities from grassroots to policy dialogue.

# Chapter 5

## **Ministry of Jihad-e-Agriculture**

### **1. Abstract**

#### **Introduction**

Iran has:

12.4 million Hectares of forest;

90 million hectares of pasture;

40 million hectares of desert and salt desert;

18.5 million hectares of agricultural lands and other;

10.5 million Hectares are lands for dry farming;

4 million Hectares are city, village, sea, lake, lagoon and swamp;

12.22 million Hectares are Agricultural crops;

2.34 million Hectares is cultivated land.

### **2. Events effecting agricultural section.**

Important natural events in Iran, which affect different agricultural parts, are as follows:

1. Geological dangers earthquakes, expulsion, and earth weight movements;
2. Climatical dangers (flood, draught, heat, storm, wind, hail, thunder etc);
3. Biological dangers, desert making, flowing sands, pests and diseases, devastation of all plant and animal genetic reserves.

### **3. Management of natural events on agricultural section**

In order to manage, explore and take effective measurements to monitor and warn and decrease natural event's effect on agriculture. Three special groups have been created:

1. Agricultural and animal husbandry's task group;
2. Special group of pests, plant diseases and frost bite;
3. Special group for revival of pasture and against draught.

The members of these groups are organizations, ministries and related executive systems. They meet to describe specified duties and internal regulations related to agricultural Jihad for arrangements for dealing with unexpected events. The national readiness group and readiness group of the provinces also play an important role.

#### **4. General policies**

Food security and stable production and advancement in agricultural section by observing and maintaining environmental issues and biological equilibrium.

1. Study or research and produce science to recognize, monitor forewarn, prevent and control natural events;
2. Maintain, reform and principally and logically enjoy producing sources (water, soil, forest, pasture, domestic animal and aquarium animals). According to special situation of each region, collecting system and pattern of farming agricultural and garden crops for each region;
3. Tribe organization, changing domestic animals from light to heavy, advancing industrial animal husbandry and decreasing the amount of domestic animals for pasture;
4. Maintaining land efficiency, comprehensive studying of aquiferous domains, providing and supplying aquiferous plan, controlling erosion, stabilizing flowing sands and desert removing;
5. Organizing non-governmental organs necessary for agricultural section and technical and financial supports to them in order to enjoy sources and produce section more and in respect to control and decrease damages and natural event's affect;

6. Policies and supporting and insuring ways to support producers, production and establishment of agricultural section and damage payment to those who sustain damages.

## **5. Knowledge management and culture making**

1. Performing executive projects and developments in the field of water and soil, reforming seed and young tree, reforming race and training domesticated animals and aquarium animals, forests, pasture, aquiferous, pests, plant and domestic animal diseases and its way of control;
2. Enjoying biotechnological and genetic engineering on agricultural section, collecting suitable ways and using modern technology to develop agriculture and domestic animal suitable with climatically and geographical situation of the country;
3. Protection, collection, evaluation, revival and developing genetic inheritance, variety in plant and animal biology;
4. Planning and executing scientific, technical and using training, for experts on village industry and agricultural section of employers and training techniques for related producer of agriculture and animal husbandry;
5. Presenting project's results to executors, producers and agricultural section via distributing and training plans;
6. Informing, training, cultural making, developing public readiness and awareness to natural events via newspaper, publications, bulletins and media.

## **6. Experience**

### ***A. Measures to prevent draught damages on garden and farming***

1. Decrease the amount of water on agricultural section by:
  - a. Levelling the earth;
  - b. Collect irrigating plan;
  - c. Using on suitable situation;

- d. Using wavy irrigation system;
  - e. Using raining and dropping ways of irrigating;
  - f. Making mound on mound irrigating way;
  - g. Using Maleches to decrease water consumption on farming.
2. Water supply on agricultural section:
    - a. Water productivity;
    - b. Using drainage and farm flowing waters again;
    - c. Introducing numbers resistance on from and garden number;
    - d. Change farming pattern for less water usage;
    - e. Observing allocation and water consumption;
    - f. Complete irrigation to increase product's output.
  3. draught monitoring;
  4. Collecting regional knowledge of farmers against draught;
  5. Studying water potentials and soil sources on part of country;
  6. Analysis of climatically for dry farming plans;
  7. Charge farming date of some crops (pea and beetroot) to use autumn rains;
  8. Investigating the possibility of using reform and maintaining materials of soil moisture;
  9. Investigation of anti evaporation on draught situation;
  10. Investigation the relation between overflowing of pests and draught;
  11. Way of maintaining plants Reg plasma on draught situation according dry farming of fig.

***B. Activities for decreasing the drought effects in animal husbandry***

1. Studying and investigating to determine which animals are compatible compatible with dry areas;
2. Gradual modification of breeding systems that is relied on pasture in half- closed systems in respect of determined policies;

3. Changing the kind of domesticated animal relied on pasture in heavy domesticated animal which can be maintained in closed and half-closed places.
4. Reinforcement and construction of required buildings with respect to environmental conditions;
5. Supplying required grasses of domesticated animal in drought times and natural disasters of other areas;
6. Insuring some part of existing domesticated animal in drought areas.
7. Financial supporting and credit facilities for breeding of domesticated animals in closed environment;
8. Poisoning and disinfecting domesticated animal's place.
9. Dealing with internal and external parasites of domesticated animals;
10. Supplying free drugs for domesticated animals;
11. Prevention of diseases by vaccination and preparing of domesticated animal's complementary therapy.

***C. Activities for natural sources***

1. Studying the formation of clouds;
2. General studding and executing of equilibrium design of domesticated animal and pasture;
3. Studying the desert;
4. Prevention and extinguishing fires in forests and pastures;
5. Executive- detailed studying of natural sources, which can be renewed;
6. Studying the pasture vivification by use of waste water in Jazmourian (Gonabad- Khorasan);
7. Establishment of information bank in the way of pasture and domesticated animal equilibrium;

8. Insuring the pastures and its role in decreasing the observed losses to husbandmen;
9. Field consideration of multibasin of selected yielding water in Itormozgan, Sistanoo Baloochestan, Khoozestan and Yazd provinces in order to prepare the general design of desert removing.
10. Consideration of qualitative and quantitative changes of plants in some areas with using the satellite information;
11. Investigating and determining the critical centres of wind erosion;
12. Collection, classification and assimilation of stores capacity for storing of domesticated animal's Habra sources in critical times;
13. Supplying water sources in pastures;
14. Constructing insulation surface;
15. Distribution of water and flood water in pastures, constructing the small barriers and small and large pools;
16. Preserving and executing the pasture designs, executing the yielding water operations for nourishing the under ground sources and the improvement of pastures;
17. Malech, bush planting and planting saplings in order to stabilize the flowing sand.

***D. Activities and experiences related to the cold and frost-damage to agricultural crops***

1. Designing and executing the investigational project as decreasing the wastage resulted from coolness and frost- bite of agricultural crops;
2. Challenging projects with spring coolness with using the frost- damage anti- nuclear bacteria on agricultural crops in 10 provinces;
3. Collecting and establishing the information bank of cold and frost-damage of agricultural crops in the country;

4. Disposing the empirical and scientific congress with internal and external professionals;
  5. Disposing the instructional workshop to elevating the professional information surface, agricultural operators;
  6. Disposing the national fairs on the occasion of the week of natural disasters in country;
  7. Executing the investigation projects about frost-damage of agricultural crops by research units for obtaining the resistant kinds to coolness tension which up to date 69 investigation projects have been executed and obtained results are presented for agricultural operators. 16 investigation projects are currently underway;
  8. Assessments of damages dimensions and loss degree resulted from different factors of cold and frost-damage phenomena;
  9. Informing about the susceptibilities of agricultural and garden crops against different degrees of cold and its occurrence time in proportion z the susceptibility stages of plants;
  10. Identifying the general and geographical conditions of the areas which are under the effects of atmospheric factors and informing them of general state of cold and frost-damage phenomena;
  11. Assessment of traditional and modern methods against frost-damage as tools and equipment for preventing or decreasing the coolness effects (store, sinking, water spraying, use of the protection coverings, use of domesticated animal fertilizer, observation of planting time, use of early kinds, on time collecting of crops, wind- producing machines...)
  12. Available facilities for regional, national and local warnings from probabilities or decisiveness of phenomena on occurrence and its quantitative dimensions.
- 7. Offers and expectation.**

1. Formation of informing regional nets to monitor reasons and predicting draught, frost damage, pests and plant and domestic animal diseases with cooperation from countries of the Pacific and Mediterranean;
2. Developing and expanding national and region cooperation and performing research, common plans and experiments on gaining control over and decreasing natural event's effect.
3. Facilitating the provision of necessary equipment to equip and forewarn and warning systems

# Chapter 6

## **The Iranian Red Crescent Society**

### **Activities of the Iranian Red Crescent Society to mitigate the effects of disasters**

The Red Crescent Society of the Islamic Republic of Iran (“IRCS”) as a non-profit, charitable non-government public organization and on the basis of its Statutes’ para.1/2/3/4/5 of Article 3 and article 5 as well as the *raison d’être* of its establishment and its undertakings as a member of the International Red Cross/Red Crescent Movement has as its mission to plan and be prepared to respond to the disasters and render rescue and relief services to disaster-affected people, fully observing the seven fundamental principles of the Movement.

Therefore, IRCS has done its utmost to achieve the objective of mitigation of disaster effects, especially in the past 10 years, in pre-disaster, disaster and post-disaster phases. A summary of activities is given below under four topics:

#### **1. General policy**

##### **1.1 Amendment of the IRCS’s Statutes**

In order to strengthen the IRCS’s relief & rescue services and its active participation in treatment and rehabilitation at the disasters, necessary amendments have been made to the IRCS’s statutes, requiring all other related organizations to coordinate their activities with those of the IRCS to achieve general coordination in responding to disasters.

##### **1.2 Ratification of the National Comprehensive Disaster Plan**

In order to mitigate the effects of natural disasters and create necessary awareness in the general public as well as providing clear definition of the roles and responsibilities of organizations involved in disaster response, the National Comprehensive Disaster Plan was developed, as per Article 44 of the Third National Development Plan, and approved by the Cabinet of Ministers. The plan has been developed to design general policies, national planning and supreme monitoring in the management of national disaster crises.

##### **1.3 IRCS’s Relief & rescue rules of procedure**

In order to optimize the use of IRCS's resources, equipment and capacity in handling mitigation of natural disasters' effects, IRCS's relief & rescue rules of procedure were revised, approved and implemented. Responsibilities of the IRCS's Relief & Rescue Organization have been defined in the modified rules of procedures at the following levels:

- a. Pre-disaster (prevention and preparedness);
- b. Disaster (rescue and relief);
- c. Post-disaster (normalization and reconstruction)

#### **1.4 Relief & Rescue: policy making, regulations, planning**

1. Reviewing current rules and law;
2. Reviewing, approving and implementation of Relief & Relief regulations;
3. Developing the plan for systematization of the national Rescue and Relief network;
4. Developing National Disaster Plans and its implementation;
5. Developing and standardizing relief & rescue plan;
6. Developing and implementation of reinforcement plans for national rescue & relief;
7. Developing and approving the plan for transferring operational and logistic premises of relief & rescue;
8. Developing the plan for documentation of disasters;
9. Identification of all the Iranian disaster-affected areas;
10. Completion of the comprehensive information system;
11. Developing disaster warning and logistic systems;
12. Developing plans for an activity evaluation system;

13. Responding to the needs as well as the emergencies of national disasters through a 3-digit telephone number;
14. Developing a system for directing disaster situations and implementation of relief & rescue regulations;
15. Establishing and equipping Emergency Response Teams (ERU's) for relief & rescue abroad.

## **2. Management of Knowledge; Culture-fostering in the General Public.**

1. Lessons learnt from the disasters which have struck the country over the past ten years show that the people themselves, especially residents of the disaster area, are the first available relief forces at the disaster scenes. Therefore, education of the general public and promotion of safety and self-help culture can considerably assist disaster victims. In this connection, the IRCS is holding first-aid general training free of charge throughout the country in factories, offices, schools, etc. We hope to achieve our objective of “one relief-worker per family” in the near future. These training courses covered over 1 million people last year;
2. Holding specialized training in the areas of relief in the mountains, on the road, flooding, debris-clearing, search, settlement, camps, emergency food provision to strengthen the relief-workers’ specialized capacity in the fields of operation, taking into consideration the latest developments in the area;
3. Preparing for more participation of volunteers in IRCS through appropriate amendment of the Statute as well as organizing volunteers into different groups of participation, direction and skill.

### **2.1 Establishment of the IRCS Scientific and Applied Sciences Institute**

The Establishment of IRCS Scientific and Applied Sciences Institute teaching disaster management, relief operations, disaster relief and rescue, etc., in order to train specialized personnel to fight disasters has been warmly received in the country. It has already provided trained staff who are highly instrumental in improving the IRCS’s capacity.

- a. Carrying out research on disasters and accidents as well as their effects;
- b. Carrying out researches on ways to fight accidents and disasters;
- c. Carrying out strategic studies to improve relief & rescue;
- d. Developing and implementation of relief & rescue standardization plan;
- e. Developing a plan for ways of debris clearing during relief & rescue operations.

The above-mentioned researches are either finalized or are under way on the basis of their priority. Their results will be taken into consideration for the relief & rescue planning throughout the country.

## **2.2 Utilization of existing facilities and technology**

1. In order to achieve optimum and appropriate response in relief & rescue, facilities and equipment for this area have been provided and distributed around the country. Using these facilities and equipment, IRCS has managed to operate with a high capacity at the disasters;
2. Centre for training sniffer dogs as per international standards has been established with branches in eight of the most disaster-prone provinces. Using sniffer dogs has rendered search & rescue more effective;
3. Iris's Air relief unit with its 5 helicopters as well as technical staff specialized in relief & rescue, especially air search, has rendered valuable services and, hence, will be further developed.

### **3. Planning and Preparedness for effective response**

In order to improve the capacity in handling disasters and accidents, IRCS has established relief & rescue bases for winter, New Year holidays, on the roads, on sea as well as air relief. With further equipping and stretching this bases- working on temporary or permanent basis, IRCS has also become active in the area of rescue and now with its strong intervention in rescue phase of accidents and disasters is recognized as one of the most active rescue rendering non-profit organizations in Iran. Currently, there are 89 on-the-road relief bases to be increased to 115 by the end of March 2005. They are around the clock relief & rescue bases active on the main roads throughout the country. Winter as well as New Year holiday's bases render the same services but on a temporary basis.

A plan for National Comprehensive Relief & Rescue Network to render prompt and timely response in numerous natural and other disasters has also been approved and implemented.

#### **3.1 Response preparedness**

As instructed by the National Relief & Rescue Comprehensive Plan, internal and external manoeuvres are being conducted throughout the country in the areas of natural and other disasters to maintain and prepare relief forces as well as facilities and equipment. In these manoeuvres, responsibilities and roles of all the organizations involved in relief & rescue are simulated. They are also conducted on different occasions as part of general training, getting the general public acquainted with disasters.

#### **3.2 Meetings and specialized conferences**

To increase the knowledge of the staff as well as management of the organizations as members of the National Disaster Headquarters, regular annual meetings are being held in which different subjects, appropriate methods and general policies as regards mitigation of the effects of natural disasters are presented as lectures, etc. This will help such organizations in planning and operations.

#### **3.3 Storage and warehousing of relief items**

1. Making and equipping over 200 000 square meters for warehousing throughout the country;

2. Preparing typical maps for relief bases to standardize ICRC's bases and warehouses;
3. Planning for establishment of a platform and a warehousing complex at the International Emam Khomeini Airport;
4. Provision of all relief items at the scale of 2% of the Iranian population and stocking them in the warehouses throughout the country for easy and timely access and rendering appropriate and optimum response at times of disaster;
5. Completion of fire-extinguishing systems in the ICRC's warehouses;
6. Completion of information database system for warehousing purposes;
7. Automation of packing system of the Relief & Rescue Organization.

### **3.4 The Center for Direction of the Relief & Rescue Operation**

All the regularly updated information and statistics to be used by the management of the relief & rescue operations are being kept in the data bank of the center using DMIS (Disaster Management Information System).

### **3.5 Recruitment skilled personnel**

1. ICRC has recruited specialized personnel throughout the country as part of its efforts to improve its response capacity;
2. Recruitment of volunteers through the Society's Volunteer Organization as well as Youth Organization;
3. Making ICRC's high school and university centers more active to recruit young members.

### **3.6 Radio communication**

1. Developing ICRC's comprehensive communication plan;
2. Completion of the communication equipment system;
3. Provision of mobile and satellite telephones for all the provincial chapters;

4. Making use of the CODAN system;
6. Development of IRCS's countrywide communication system;
7. Equipping all the IRCS's bases with efficient and appropriate communication systems;
8. Improvement of HF system;
9. Equipping the VHF system to cover the whole country and elimination of communication blind points;
10. Developing and implementation of joint plans with other organizations involved in national relief and rescue.

### **3.7 Psychological Support**

To improve and develop psychological support of the disaster victims, the Relief & Rescue Organization has set up its own psychological support division. This division rendered the urgently needed psychological support services to victims of the December 2003 Bam earthquake efficiently and effectively.

#### **4. Lessons learnt from Disasters**

1. Exact planning for stocking of well-assorted relief items in the relief warehouses and bases throughout the country proportionate to 2% of the Iranian population who are in danger of disasters at any point in time;
2. Capacity-building and coordination among members of the National Disaster Headquarters at the levels of cities, provinces and the country; holding regular meetings to discuss ways to achieve the objectives of the National Comprehensive Relief & Rescue Plan;
3. Planning to make optimum use of locals who are acquainted with the culture of the disaster affected areas;
4. Planning to maintain coordination and to make optimum use of Participating National Societies' relief & rescue forces;
5. Developing various disaster scenarios for Iranian cities as well as operation and response programs on the basis of the National Relief & Rescue Plan.