flood Impacts on urbanization and ruralization

The trend in Iran's population growth shows that population is increasing. About 60 percent of the total population lives in urban areas and reminder live in rural areas. The inordinate pressure on agricultural land, compounded by other reasons, has induced widespread out-migrations to urban and semi-urban areas from rural areas, which is a key factor in the growth of vulnerability.
In Iran, the rapid population growth compounded by uncontrolled and perpetual changes in the human-use system has contributed to hazard effects by exposing more people and properties to risk, giving rise to ever increasing consequences.
With the current level of population, vulnerability to floods is now rapidly increasing in the urban and rural areas, which are likely to present the greatest flood hazards for the future.
Flood damages comprise broadly two groups, direct and indirect. Direct damages are physical and usually 'visible' losses arising out of direct contact with water (e.g., damages to house structure). Indirect impacts are the consequences of direct contact of property with water and are revealed thought interruption and disruption of economic and social activities (e.g., production losses due to e.g., direct losses to machinery). Indirect effects can involve effects both in the short and long run. Indirect impacts, together with the direct ones, may result in a further chain of effects over time, called linkage effects. Number of dead caused by flood in different provinces of I. R. Iran are shown in (15) figure [4].

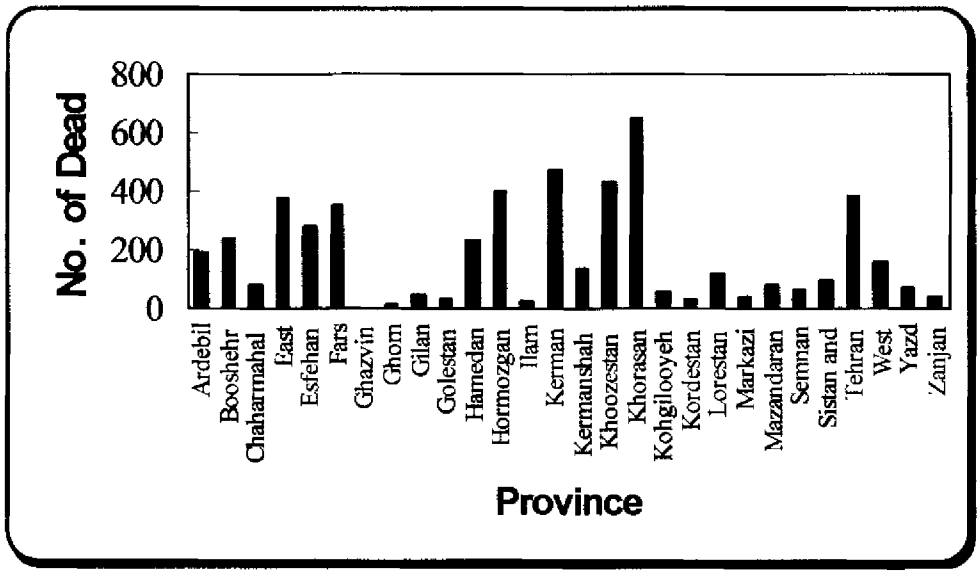


Figure 15. No. of Dead Caused by Flood in Different Provinces of I. R. Iran (1990-2002) [5].

Based on the last decade experience, it is shown that flood have some more serious affects on the following sectors:

1. commercial sector
2. Linkage sector
3. Roads sector
4. Residential sector
5. Agricultural and non-agricultural sectors
6. Livestock and etc [4].

But In recent years Iran try to use flood risk assessment and flood risk management there for, we study more about this subject in this following. The framework for flood risk assessment and management in Iran is shown in figure (16)

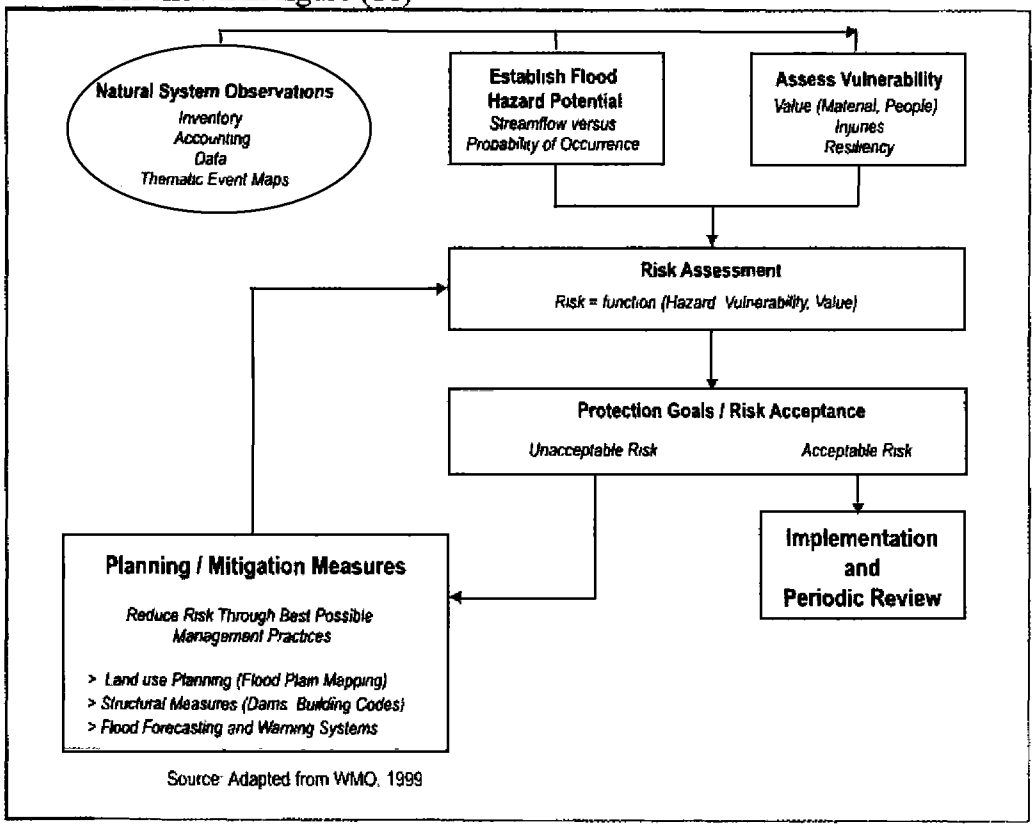


Figure 16. framework for flood risk assessment and risk management [6].

Information technology in Iran

It may be observed that advancement in Information Technology in the form of Internet, GIS, Remote Sensing, satellite communication, etc. can help a great deal 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. Remote Sensing, on the other hand, as a tool can very effectively contribute towards identification of hazardous areas, monitor the planet for its changes on a real time basis and give early warning to 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. It is absolutely necessary to create awareness amongst the public as well as decision makers for allocating resources for appropriate investments in information technology. In this paper an attempt has been made to highlight the role of information technology in management of natural disasters in Iran [10].

With an increase in the perception towards spreading a culture of prevention in the disaster management scenario, considerable emphasis is now being placed on research and development activities in the area of information technology for disaster preparedness and prevention. This has brought in a significant positive change even though the multitude and frequency of disasters in the country has increased[10]

Application of Information Technology in Disaster Management

Though it is not possible to completely avoid the natural disasters, but the sufferings can be minimized by creating proper awareness of the likely disasters and its impact by developing a suitable warning system, disaster preparedness and management of disasters through application of information technology tools. The changing trends have opened up a large number of scientific and technological resources and skills to reduce disaster risk. The IT tools are discussed below[10]:

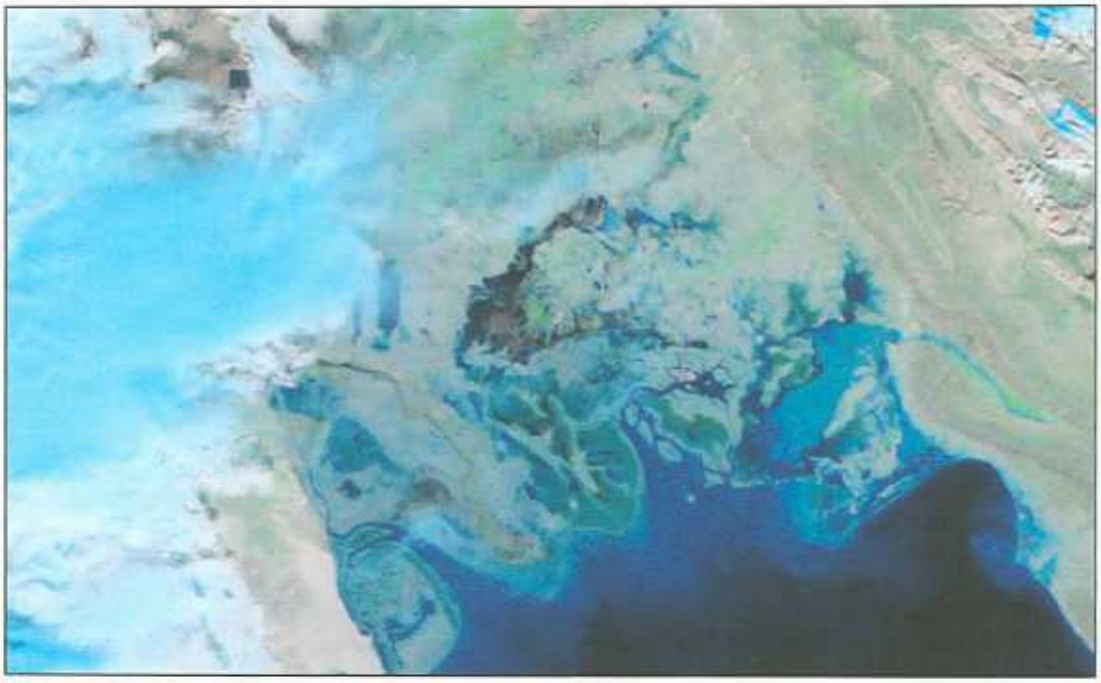
GIS and Remote Sensing

GIS provides 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 modeling of variety of data types related to natural phenomenon. Remote sensing makes observation of any object from a distance and without coming into actual contact. Remote sensing comprises Aerial Remote Sensing which is the process of recording information, such as photographs and images from sensor 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, Advanced Very High Resolution Radio. Some application of GIS and Remote Sensing in flood is as follows[10]: Satellite data can be effectively used for mapping and monitoring the flood inundated areas, flood damage assessment, flood hazard zoning and post-flood survey of rivers configuration and protection works.[10]

Flood monitoring using satellite data

In general flood monitoring in Iran could be studied from 3 aspects: flood forecasting, flooding potential and flood zoning. Using daily satellite data has made flood monitoring and alerting phenomena possible. One of these, are NOAA Meteorological satellite data. This satellite gives two coverage of the same area per day. Few studies have been carried out on flood forecasting using satellite data in global level. Most of the researches have been carried out on the Atmospherics flows (including cloud movements). But in the field of flooding potentials, satellite data are very useful, for example in watershed flooding potentials, satellite data are very useful, for example in watershed flooding hydrograph producing with SCS method in soil classifying map production, vegetation cover percent, channel and drainage map and watershed topography are very useful. Satellite data in the field of flood zoning in watersheds with high receptivity have the major application. One of this kind of data is NOAA Meteorological satellite data. NOAA satellite covers each area 2 times a day for the users of these data. Iranian Remote Sensing Center is the receiver of NOAA data in Iran [11]. about using NOAA satellite, there are many studing, for example, in Iran, NOAA satellite are analyzed with making use of remote sensing (RS) soft wares and hypsometric map of watershed is reproduced by making use of GIS soft wares and then hydrological and hydro

meteorological data such as precipitation and temperature… are transfer to models and finally after some stages snow melt runoff, is recorded at hydrometric station. Satellite flood maps of I.R. of Iran are shown in the figure



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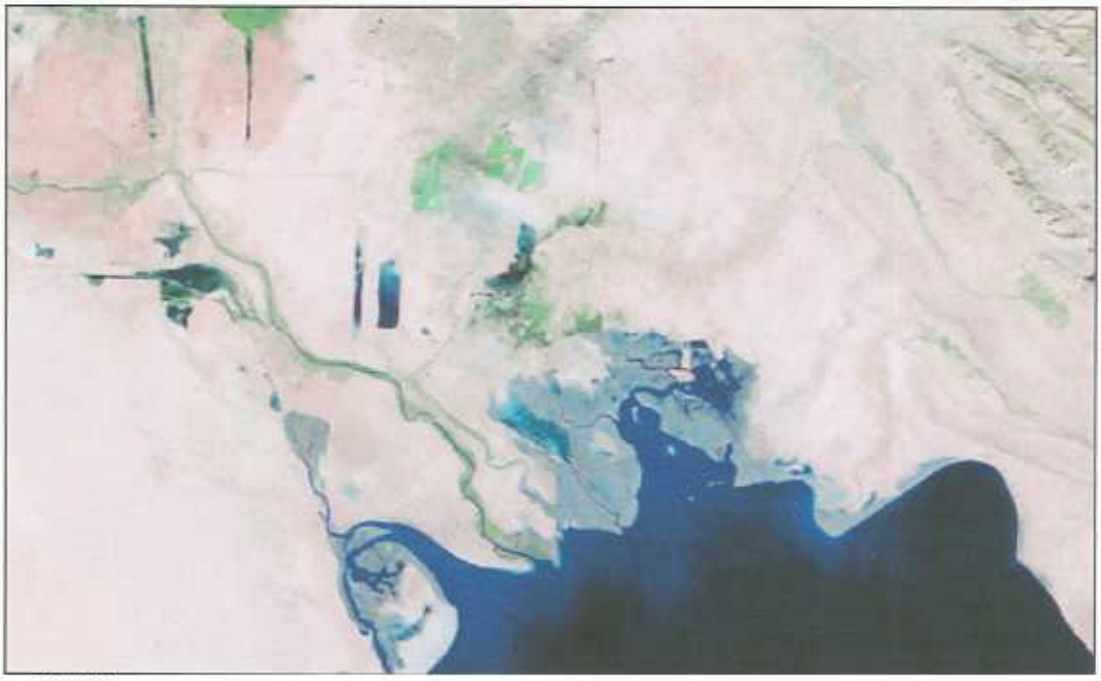

November 7, 2003

Figure .Floods in Iran [11]

Flood disaster mapping

Flood mapping in Iran, defines the area at risk and should be the basis for all flood damage reduction programs and subsequent actions. These maps often have a legal connotation in terms of zoning and other structural and non-structural measures undertaken, so they need to be accurate and credible.
These flood 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 meeting.
In Iran, Maps become the common element in terms of identification of flood-prone areas, identifying the risk to individuals and lending institutions, preparation of emergency response plans, and design of flood protection and flood proofing measures. Perhaps their greatest value is as an educational and communications tool, and they should be readily available to the public as well as to emergency response agencies at all levels of government.
In Iran, a number of tools are available to array and display information for the use of technical experts, to explain programs of flood damage reduction to the decision-makers, and to communicate real time forecasts and warnings to the public. For this purpose, The advanced information technologies such as GIS and Remote Sensing apply for flood risk mapping and the management of flood hazard in Iran.
About flood risk mapping, by using GIS and remote sensing, some models such as HEC-1 Model are transferred in Iran. At first in transferring this model flood hydrograph is drawn and then by using necessary in formations, the numerical model of watershed, sub-basin maps, input files for SCS artificial unit hydrograph approach and sinematich wave for hydrograph estimating of sub basin are prepared.
In next stage by estimating of output flood hydrograph in watershed, flood mapping by using HEC-1 MODEL SAS approach and MIKE 11 model is determined.

Objectives of the flood mapping in Iran are included:

- To develop land use map for Muzaffarabad City by applying GIS as a tool.
- To show critical facilities which are vulnerable to flooding.
- To create a GIS database for flood prone area in Muzaffarabad city.
- To delineate classified hazard map. [7]

Flood management:

There are 3 phases for flood management in Iran:
–*Floodplain management* (before flood):• preventative activities to reduce flood impacts
• environmental management activities

–*Flood response* (during flood):
• operational activities
• emergency management

–*Flood recovery* (after flood):
• assistance to get back to normal life
• disaster relief [2]

Flood Plain Management

Management of activities within the flood-prone area can significantly reduce flood damages to existing development and prevent the amount of damages from rising in the future. The most desirable approach is to prohibit new development in the flood plain and to flood proof existing structures, or to replace the existing development by alternative usage of the land. However, where the amount of present development is substantial or the flood plain is essential for the production of food or other key economic activities, alternate strategies such as flood proofing and protection can be considered. Floodplain management strategy in Iran is shown in figure17 [6].

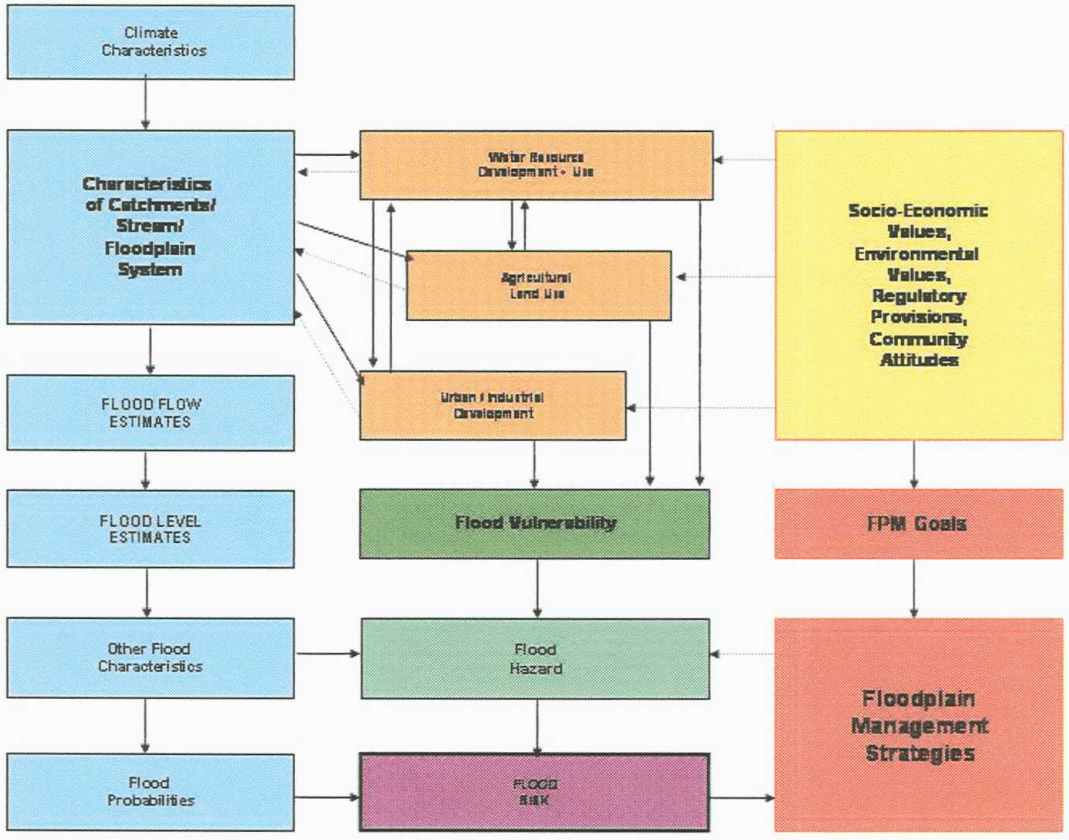

Figure 17. Floodplain management strategy in Iran [2]

Flood Plain Management is a decision making process the goal of which is to achier wise use of the nation's flood plains.
'Wise use' is any actively or set of an activity that is compatible with the risk to natural resources (natural and beneficial functions of floodplains) and human resources (life and property).

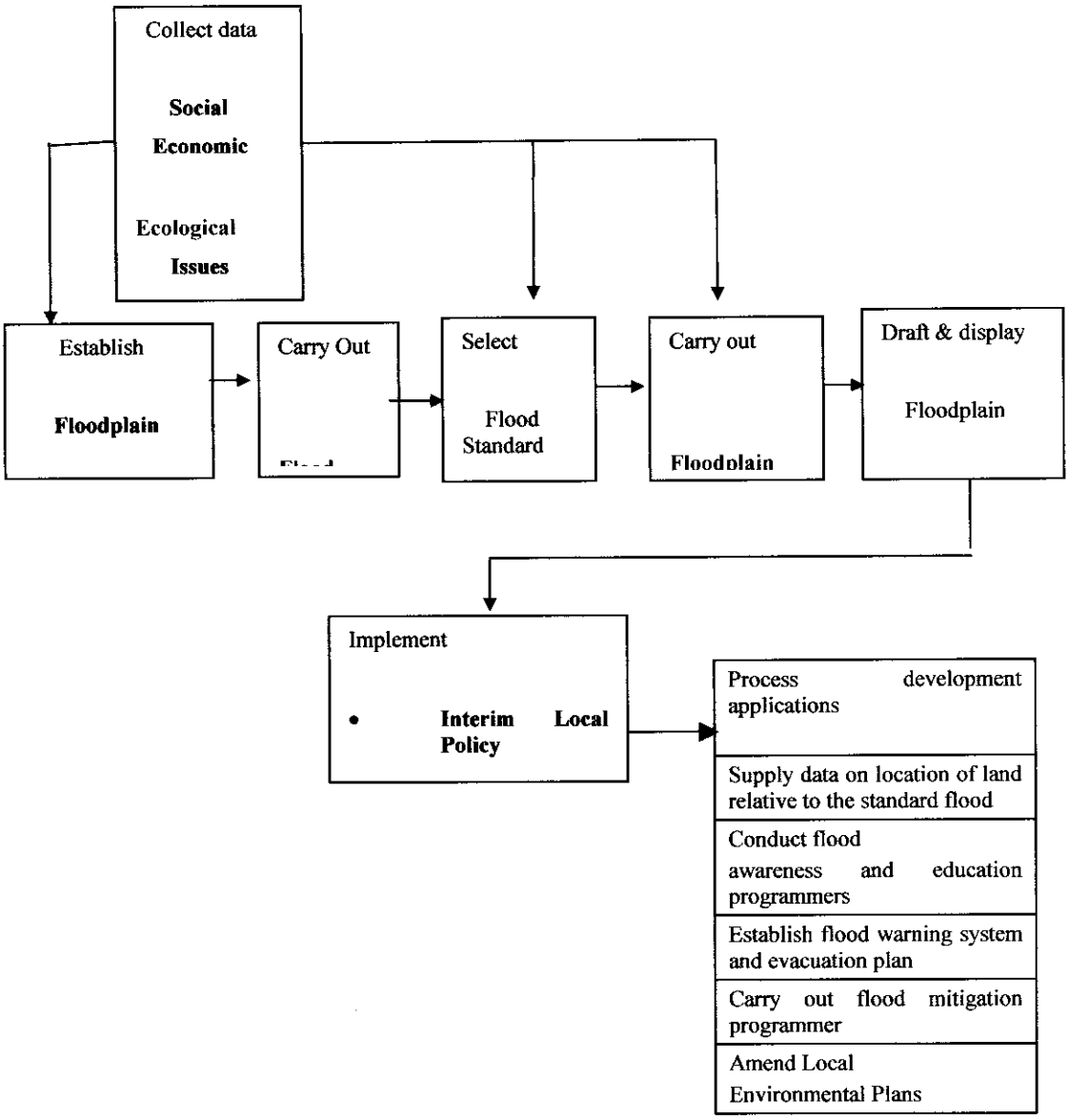

Figure 4: the floodplain management system,

(from the new south Wales floodplain development manual (1996)[9]

Accomplished measures in related flood in Iran

There are some accomplished measures in Iran in relationship with flood:
1- study, Design & Implementation, 2-Training & Tools [2]

1- Study, Design & Implementation

- *River engineering projects*

This action started in 1984 as a new stage, that it is included:
A-River Training & Flood Control For 9 Large Rivers by Using National Budget
B-More than 300 Small Flood Control Projects In Different Rivers

- *Construction Large Dams*

about this there are more than 80 projects which some of them is finished and reminder are implementing.

- *Flood Plain Zoning Maps*

According researching in Iran, total length Rivers in Iran : 200000 Km. The First Order For Flood Plain Zoning :37000 Km, and Flood Plain Zoning for 10000 Km is doing.

-Flood Warning Systems

flood warning systems is doing for 4 important rivers in Iran

-Watershed management

more than 100 projects are doing

- *Standard scope of work for consultants*
- *River engineering consultant promotion*

-Use of Modern Technology

e.g. G.I.S., R.S. & Mathematical modeling

-International cooperation

Iran hade some international cooperation for example:
A- River training in Hirmand river with corporation of world bank (1991-2000)
B- Held seminar on flash flood prevention & mitigation with corporation UNDP (2003)

-Regional cooperation

-International Cooperation

A- meteorology parameters.
B- Hydrological parameters.

- *Interchanges of experiences*

Education & training

-Flood warning is sharing watershed with cooperation regional countries

2- Training & tools

-Seminar, Workshop , Exhibition ,Films & Text books

-Standard manuals for design , operation and maintenance

-Hydro-Environmental Mathematical Analysis Tool (HEMAT)

-Iran rivers & flood website
(www.iranrivers.com or www.iranflood.com) [2].

Recommendations

Following Operations are Strongly Recommended:
1. Flood Mitigation and Preparedness
2. Integrated Flood Risk Management
3. Integrated Analysis of flood risk
4. Analysis of Flood Frequency
5. Analysis of Hazard
6. Evaluation Damages
7. Selection and Integration of Structural and Non-Structural measures
8. Land-use Regulations
9. Environmental Impact Assessment
10. Development and Implementation of flood Management Plans
11. Integration Between Nations and Exchange Information
12. Raising Disasters Research Education and Public Awareness
13. Flood Risk Reduction Related Science and Technology