

**DRAFT REPORT OF THE UN
INTER-AGENCY FLOOD
RECOVERY MISSION TO
GOLESTAN, IRAN**

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Contents

1	INTRODUCTION	3
2	A PROFILE OF GOLESTAN PROVINCE	4
3	ANALYSIS OF FLOOD AND DROUGHT IN GOLESTAN	5
3.1	The Floods Impact and Relief Activities	5
3.2	Natural Resources	6
3.3	Agricultural and Livestock	8
3.4	Forestry and Rangelands Management.....	10
3.5	Water Resources	11
3.6	Human Settlements and Land Use	12
3.7	Disaster Response and Management.....	14
3.8	Institutional Arrangements	
4	CONCEPTUAL FRAMEWORK.....	
4.1	Problem Analysis	17
4.2	Approach.....	18
5	REHABILITATION OF THE DOOGH RIVER BASIN	18
5.1	Goals and Objectives.....	
5.2	Assistance to those affected by floods: housing and services	
5.3	Identification and Removal of immediate future flood risks	
6	INTEGRATED WATER BASIN PLANNING AND MANAGEMENT FOR THE GORGAN BASIN	
6.1	Goal	
6.2	Strategy:.....	
6.3	Objectives	
6.4	Development of an Integrated River Basin Management Plan for the Gorgan River basin	
6.5	Pilot Activities	
6.6	Enhance Public Awareness	
6.6.1	Disaster Risk and Vulnerability Reduction Error! Bookmark not defined.	
7	THE ROLE OF THE UN SYSTEM IN RECOVERY AND REHABILITATION....	29
	ANNEXES.....	31
	Annex I: Terms Of Reference	32
	Annex II: Programme Of Visits Flood Recovery Mission	36
	Annex III: People Consulted	34
	Annex IV: Institutional Structure In Golestan	39
	Annex V: Hydrological, Land-Use And Protected Area Data	
	Annex VI: Conceptual Framework For Integrated Water Basin Planning And Management	41
	Annex VII UNDP Proposal for Rehabilitation Activities in the Doogh River Basin	

1 INTRODUCTION

On Friday, 10 August 2001, torrential rains triggered flash floods in the Gorgan and Doogh Rivers in Golestan, Iran. Areas of Khorasan and Semnan provinces were also affected. The flash floods in Golestan were the worst in 200 or more years, killing some 247 people and leaving over 10,000 people homeless. In addition the floods destroyed some 15,000 ha of farmland and 10,000 ha of forest and rangeland. Financial losses for the province were estimated at 491 billion Rials, or US\$61.6 million.

Following the floods the Emergency Response Division of UNDP, in consultation with the Tehran Country Office, agreed on the need to support the Government in the preparation of an integrated and comprehensive recovery and rehabilitation plan. UNDP was joined by UNEP and FAO in fielding a seven person inter-agency mission to Iran between 14 and 26 October. The objective of the mission was to assist the Government of the Islamic Republic of Iran to formulate a strategy and framework for post flood recovery and rehabilitation in the flood affected areas of Golestan. The complete Terms of Reference are attached as Annex I.

The mission's terms of reference were clearly to formulate a strategy and framework for post flood recovery and rehabilitation. However, on arrival in Golestan it became clear that the Provincial Government had commenced reconstruction and required technical advice and comment from the team on their work and on ways in which it could be improved. In carrying out its work the team has attempted to meet both expectations.

The mission team comprised five experts from UNDP Emergency Response Division, one from UNEP and two from FAO. The second expert from FAO joined the team towards the end of the mission to carry out some additional tasks and complete a more detailed programme outline. The team was comprised of the following persons:

Robert Mister	Team Leader	UNDP/ERD
Mohamad Mukalled	Hydrologist	UNDP/ERD
Takehiro Nakamura	Natural Resources	UNEP
Ali Noori	Environment Planning	FAO Tehran, Consultant
Roland van Oosten	Human Settlements/ Planning	ERD Consultant
Carlos Ramos	Agriculture/Livestock	ERD Consultant
Aisling Haghshenas	Translator/Interpreter	
Barry Stride (24 Oct - 5 Nov)	Agriculture/Livestock	FAO

The Mission spent five days in the flood-affected area in Golestan and the remainder in Tehran for meetings with UN and Government and for strategy formulation and report writing. In Golestan the team met initially with key provincial officials from government departments at the Governor's Office. This was followed by extensive visits to the Doogh and Gorgan River catchments accompanied by technical experts from government departments. In Tehran an initial meeting was held with the Disaster Task Force (DTF) prior to the visit to Golestan. Further meetings were held with the UN system, the DTF and selected technical ministries prior to completing this draft report. A detailed itinerary is attached as Annex II. A list of people met with is attached as Annex III.

This report is divided into two main parts. The first provides background information on the Golestan Province and on the floods and their impact. It then provides some

analysis of the causes of the flood. The second part of the report provides an analysis of the overall problem and the concept by which the mission has approached post flood recovery. An outline of immediate recovery needs is detailed in Section 5 followed by a proposal for integrated watershed planning and management in Section 6 of the report. Finally the report looks at the role of the UN System in Golestan flood recovery and watershed management and provides details of financial inputs required to extend the work being undertaken by the Golestan Provincial Government.

Whilst this report has focused on watershed management and flood recovery in the Gorgan and Doogh river systems the team believes that the proposed approach would have applicability in other parts of the South Caspian region and to other parts of Iran.

The mission would like to thank the staff at UNDP Tehran, the national Disaster Management Task Force, the Golestan Provincial authorities and various government departments for the cooperation and hospitality provided whilst they were in Iran.

2 A PROFILE OF GOLESTAN PROVINCE

Golestan province is located in the Northern part of Iran on the south eastern shore of the Caspian Sea. It is bordered by the Republic of Turkmenistan in the north, Semnan Province in the South, the Caspian Sea in the West and Khorasan Province in the East. The total area of the Province is around 20,300 Sq. Km. The administrative capital is Gorgan city and as with other provinces in Iran, Golestan is divided into townships, districts, rural districts and villages. It has 16 cities, 11 townships and 47 rural districts. Annex IV contains information on the current structure for the Province. Total population of the Province is 1,426,288 of which 41.3% live in urban areas and 58.2% in rural areas. Around 0.5% of the population are considered to be nomadic and a large minority are of Turkmen origin.

The presence of the Alborz Mountains, the Caspian Sea and the Southern deserts of Turkmenistan affect the climate of Golestan. In the central and western part of Golestan the annual rainfall reaches a level of around 850 mm/year. In the northern and eastern part the annual rainfall is around 200 mm/year. The average is 408 mm/year. The maximum, minimum and average annual temperatures of Golestan are 35.9 (July-August), 3.4 (December-January) and 18°C and the average number of days below zero is 10/year.

A unique feature of Golestan is the Golestan National Park covering an area of 92,000 ha. It is a living museum with a great diversity of rare species of plants and animals. It is the habitat of 69 types of animal, 146 types of birds, 8 different types of fish and many sorts of rare insects, reptiles and amphibious species. Due to its exceptional environmental and natural characteristics the park has internationally been recognised as a protected area. The park has a recreational function and each year is visited by large numbers of tourists, whilst scientists study the rich diversity of flora and fauna.

Golestan rises from 25m below mean sea level on the Caspian Sea shore to mountains 3,800m above mean sea level. Approximately one half of the Province is hills or mountains and the remainder alluvial plains. There are 5 basins within the territory of Golestan Province, including Atrak, Gorgan, Gharehsou, Gorgan Bay and Nekaroud. Annex V contains tables on the main characteristics of these river basins, land use types and protected areas.

The Gorgan River system originates from the mountainous arid area in Golestan, Semnan and Khorasan Provinces. The catchment is approximately 12,600 km² and the main Gorgan River approximately 350 km in length. It discharges some 448 million m³ of water annually. The river also transports some 1.336 million ton of sediment per annum (Caspian Environment National Report of the I.R Iran). The Doogh River is a tributary of the Gorgan River and spans approximately 101 km in a catchment of approximately 1,800 km². Of this 300 km² is covered by forests and 1,500 km² is covered by farmland and grazing land. The average slope of the riverbed is estimated at 1.5 %.

Midway along the Gorgan River is the Voshmgir Dam. This was constructed to provide irrigation water, and to reduce sediment flow downstream. A further dam, the Golestan Dam, has been constructed upstream of the Voshmgir Dam for the main purpose of controlling and reducing sediment in the Voshmgir Dam. The Golestan Dam also provides irrigation water from its reservoir. A third dam, the Bustan Dam, is under construction upstream of the Golestan Dam. This is also intended for irrigation and flood control.

The total area of cultivated land is 65,000 ha of which one-third is irrigated farmland and two-thirds are dry farmland. Total agricultural production is 2.5 million tons with the main products being wheat, barley, cotton, tobacco and rice. The province counts 5 million livestock units and around 16 million units of fowl. The total annual production of fish and caviar is 10,000 and 37 tons, respectively.

Approximately 82% of the rural villages have access to potable water and 95% are connected to the electricity grid. Health services are available to most of the population.

3 ANALYSIS OF FLOOD AND DROUGHT IN GOLESTAN

3.2 The Floods Impact and Relief Activities

Since 1998 Golestan Province, particularly the southeastern part, has been affected by a severe drought with rainfalls considerably below the average of 200mm per annum for these areas. These drought conditions triggered a limited migration from the villages to other locations where water or livelihood opportunities are more available. Analysis of the flash floods in August 2001 and their causal factors must be considered in relation to the drought and to some extent as a result of the effects of the drought.

On Friday, 10 August 2001, torrential rains triggered flash floods in the Golestan, Khorasan and Semnan provinces of Iran. The rainfall reached 450mm in the first 12 hours alone and peak flow in Gorgan River reached 3017 m³/sec. The heavy rain commenced at 19:00 on 10 August 2001 and continued until 07:30 on 12 August 2001. The Government has estimated that the return period for such rains is 35,000 years. The cities of Kalaleh and Minoodasht and their surrounding areas (387 villages) in Golestan, Jajarm village in Khorasan Province and Miami and Hossein-Abad Kalpoush villages in Semnan Province bore the brunt of the flooding.

The flash floods in Golestan were the worst in 200 years, killing 247 people and injuring some 200 people. Overall, 271,796 people were affected, of which 10,000 were made homeless. In terms of infrastructure 4,000 buildings were heavily damaged and road networks within the province and linking other provinces were seriously damaged. Electricity, gas, water and telephone services were cut for the affected areas but were

quickly restored. For agriculture 15,000 ha of farmland and 10,000 ha of forest and rangeland were destroyed. Financial losses for the province are estimated at 618 billion Rials, or US\$77.25 million. In neighbouring Khorasan 14 people were confirmed dead whilst in Semnan, no casualties were reported. However, there were widespread damages to buildings, agriculture and horticulture in these provinces.

The Government responded immediately with the provision of relief items that included food, cloth, blanket, tent and medicine. It also relocated 10,000 of the affected population to safe areas. Water, electricity, gas and telephone services were restored in most of the affected areas and roads repaired on an emergency basis. The Government allocated 110 billion Rials, or US\$13.75 million, for rehabilitation and has allocated grants to those affected farmers who have no insurance coverage.

The direct economic loss caused by the flood was reported to be 618.5 billion Rials (US\$77.25m), and in combination with the drought the economic effect is estimated at 1.2985 trillion Rials (US\$162.3m). The Golestan Provincial authorities reported the following damages and loss of life and properties:

- Damaged area: 6,520 km²;
- Flooded area: 1,000 km²;
- Number of people killed: 247
- Affected population (urban and rural areas, respectively): Minudasht (45,000 and 90,000) and Kalalleh (36,000 and 114,000)
- Number of affected houses (urban and rural areas) in billion Rials: 493 and 2,977;
- Total economic loss: 650.5 billion Rials
- Estimated economic damages by sector: facilities and infrastructure (373.5), agriculture (190), private properties (32), business sector (55).

Approximately 84 km of the Minudasht-Bojnord Road, which is part of the Tehran-Mashhad Road (the Asian Highway), was destroyed or damaged by the flood. Eleven other Provinces provided financial assistance for the rehabilitation of the affected roads. Damage to a hydropower stations (estimated loss of 1 billion Rials) and to small and check dams (estimated damage of over 5 million Rials) was also reported.

4.2 Natural Resources

The Golestan National Park, covering an area of 92,000 ha featuring unique biological diversity, is characterised as a transitional eco-zone between Hyrcanian and Irano-Touranian floristic zones. The forest areas, mainly in the western and central parts of the national park contain, a large number of deciduous trees and shrubs. In the humid eastern part of the national park, temperate rain forest predominates.

The park is a habitat for 146 bird species (almost one-third of Iran's total bird species), out of which 16 European bird species are supported by the national park. 5 globally threatened species (*Aegypius monachus*, *Aquila heliaca*, *Falco naumani*, *Crex crex*, *Tetrax tetrax*) and six regionally threatened species (*Permis apivorus*, *Gypaetus barbatus*, *Nephron percropterus*, *Gyps fulvus*, *Aquila pomarina* and *Falco cherrus*).

More than 15,000 large animals exist in the steppe and woodland in the National Park, and they are under threat of poaching. Wild sheep for example, are threatened. There were 10,000 wild sheep existing in the National Park, but recent poaching in the north eastern part of the National Park redistributed the population, with some even moving out of the national park.

It is reported that the vegetation cover loss associated with deforestation and overgrazing caused quicker run-off of higher magnitude. Through the interviews with visited villages, the mission was informed that the deforestation was associated with the collection of firewood for domestic energy use (particularly for cooking and heating), and its consumption is estimated at 10 m³/person/year. Another contribution factor to deforestation is slope farming.

In the Chelechai River basin, the mission observed that the steep slope land was cultivated at an accelerated speed for dry farming (tobacco, soy bean, wheat and barley). Further, overgrazing of rangelands also caused degradation of soils, causing also erosion and soil loss. The mission observed such land degradation in the upper part of the Doogh River in combination with slope farming. The Watershed Management Organization of the Golestan Province estimated that the soil erosion rate in the upper Gorgan is 30 t/ha/a. It is also estimated that the sedimentation rate is 600,000 m³ per annum in the Golestan Dam and if this current rate is maintained the Golestan dam will be filled up within 14.5 years.

Although no concrete data were obtained, it was also estimated that the sedimentation in the upstream tributaries and dams caused loss of river discharge capacity and lessened the flood retention capacity of the Golestan Dam. Further, the mission also observed that the release of the floodwater from the Golestan and Volshmir Dams also contains high level of suspended sediments, which also caused sedimentation in the middle and lower parts of the Golestan River during the flood seasons.

Although the direct impacts of the August 2001 floods for the middle and lower parts of the river were not confirmed, it is estimated that the change in hydrologic regime occurred through sedimentation by the high water during the flood duration. Again although no report was made on the impacts of sedimentation on fisheries and maintenance of habitats for some commercially important and endangered fish and bird species, particularly at the estuary of the Gorgan (also included in the Gomishan wetlands), these impacts are considered to have potential impacts on fisheries and important habitats. In the Gorgan Bay, though it is outside of the Gorgan River basin, there are 260 bird species observed, of which 90 % are migratory species (such as Pelican, white-fronted goose, Greater flamingos and white headed duck).

It is analysed that the current rate of sediment transport, particularly in the upper reach of the Gorgan basin, will accelerated the sedimentation of the Gorgan Dams. The sediment is consisted of fine and small particles and dredging during the wet season will cause re-suspension of the sediments and will flush the sediments further downstream. Since the hydraulic structure in the river is not expected to fulfil its full function under the current sedimentation scheme, urgent attention is required to soil erosion that should be controlled in the upper catchment to avoid future floods. For this purpose, current agriculture practices (dry farming on the slope) and improvement of economic conditions in the upper part of the river basin should be taken into consideration.

Due to the economic depression caused by the drought, a limited area of farmland is converted to the aquaculture, particularly rainbow trout. The traditional dry farming would provide farmers with approximately 5 million Rials per year per family, while 100 million Rials could be obtained through aquaculture per family. Such conversion of land use led to increased economic vulnerability of the inhabitants within the river basin.

5.2 Agricultural and Livestock

3.1.1 Introduction

The percentage of cultivated land in Golestan province compared to the total arable area of Iran is 4.14 %. The cultivated land makes up 26.90% of the total area of the province. The total of cultivated area in Golestan is 591.807 ha. (1997-1998). The distribution of the cultivated surface shows that 581.614 ha. (312.403 dry farming, 26.911 irrigated) are dedicated to extensive agriculture, orchards 10.037 ha. and industrial crops 156 ha.

In terms of extension and production the most important crops are wheat, barley and rice. Golestan produces 32 % of the cotton of the country 30% of the oil seeds, 28% of the tobacco, 7% of the wheat and barley and the 5% of the rice of the country.

The damage as a consequence of the floods on agriculture and livestock can be summarized as follows:

- Farming 13.762 ha
- Fruit: 445 ha
- Rangeland: 2.500 ha
- Livestock: 4837 head.
- Fish: 87.600 ud.

3.1.2 Analysis and underlying causes and problems to be addressed:

Physical characteristics such as distribution of rainfall and topography, and unsustainable use of the natural resources are the most important factors related with the role that agriculture and livestock have played in the flood of Golestan province.

In the last four years rainfall decreased dramatically. Lack of good adaptation to the new conditions has created different situations closely related with topographical distribution of the Gorgan river basin. On the other hand, although the recent policies of the Government are focused on the sustainable development of agriculture and the conservation of natural resources, these guidelines have not been reflected in the field.

In the slope areas, especially upstream, scarcity of water has led to decreases in the productivity of cultivated lands and the number of head of livestock. In many places yield of cereals has drop from 4 t/ha to 1 t/ha. Villages such as Baghchech have reduced the number of sheep from 12.000 to 2.500. At the same time, in the flat lands mainly middle stream and downstream, the drought has resulted in an increase in the duration of the fallow ranges from one to two or even three years. As a response to this situation farmers began to find new cultivated areas and places to raise their livestock resulting in increased and accelerated deforestation and degradation of the rangelands.

There are some problems relating to the agriculture and livestock sector with associated environmental problems in the Gorgan river basin:

- Land degradation is caused by a complex set of factors involving man and his stock, crop encroachment in marginal areas such as the upstream areas and fuel wood collection.
- Land tenure, settlement and incentive policies have undermined traditional land use practices and contributed to degradation through overgrazing.
- Intensification of agriculture increasing the production by using the patterns of the green revolution (increasing the amount of tractors and agricultural machinery, high

level of fertilizers and chemical products) as in the area of Hossein Abad Kalpush is a good example of unsustainable agricultural production.

- Livestock follows deforestation areas and fallow lands where ranching pushes into the remaining *frontiers*.
- Continuing human population pressures in all the Golestan river basin leads to decreasing farm sizes to a point where the mixed farming system disintegrates. Livestock can no longer be maintained on the farm. The nutrient and farm power balance runs into a widening deficit and disinvestments occurs as natural resources degrade. This process has been called *involution of the mixed farming system* (Ruthenberg, 1980). Here, with the disappearance of the resource-enhancing role of livestock, the environmental balance is disrupted, often resulting in human conflict.

Within this context the most important problem related to the agricultural and livestock sectors is the degradation of the cultivated and range lands. For a better understanding of the whole problem we can consider the following aspects:

- Livelihood pressures from local communities, which require improved incomes, basically in the upstream areas.
- Low productivity and low incomes of current land uses. In the better conditions yield of wheat varies from 4,26 t/ha under irrigation to 3,47 in dry farming conditions. For barley yield is even lower (2,41 under irrigation to 1,68 for rain fed exploitations).
- Long periods of time of land fallow that is an important factor for increasing soil erosion.
- Soil weakness in sloping farmlands requires the rotation of cultivation to avoid soil erosion. This is not happening.
- Lack of proper management planning for adequate utilization of the land, based on its real potentials and capabilities. If there is a Master Plan for the use of the land this has never implemented.
- Inefficient and unsustainable use of the water resources for irrigation. The system of surface irrigation is only marginally more efficient than the dry farming system. For example irrigated surface of wheat represents 40% of the total area and 45% of the all production. The irrigated surface for oil seed is 66% of the total and its production is the 69%. This means that the management of the water for agricultural purposes does not improve the production substantially.
- Lack of measures for soil conservation, especially in steep slopes. Cultivation rows usually follow the lines of maximum pendent, increasing erosion and run-off of the soil
- Unsustainable management of the livestock that lead to overgrazing. The number of head of livestock is 3 to 4 times more than the carrying capacity of the rangelands.
- Lack of environmental awareness among local communities on the environmental values of the ecosystems
- Lack of an effective delivery network for fossil fuels in the area. The consumption of fuel wood represents 10 cubic meters per person an year.
- Inefficient/low efficient methods for using of current energy resources
- Absence of other sources of energy, especially renewable energy
- Lack of alternative fodder sources
- Lack of environmental awareness of the damages caused by agricultural activity on natural regeneration of the forests and land degradation

- Poor knowledge of the new sustainable management and utilization methods among decision-makers and planners, especially in FRO, DOE and MOAC
- Poor knowledge of those forest ecosystems of the area that are of global importance
- Poor market information for agricultural and livestock products.

6.2 Forestry and Rangelands Management

3.1.3 Introduction

According to the current land use map of Golestan Province, around 20% of total area is covered by the forests and around 42% is covered by rangelands. The presence of different topographical features with variations in climatic conditions has created a wide range of ecosystems in the area, from temperate rain forest habitats to semi-arid steppic hills and plains. The eastern natural borders of the Caspian forests come to an end in Golestan province and the Golestan National Park is defined as a transition zone between Hyrcanian and Irano -Touranian floristic regions. From the viewpoint of phyto - sociology, Caspian forests are deciduous forests with tree species such as *Quercus castanaefolia*, *Parrotia persica*, *Carpinus betulus*, *Zelkova carpinifolia* and many shrub species in the lower and middle lands and different species of *Alnus*, *Fraxinus*, *Acer* and *Juniperus* in higher lands.

Steppic ranges are covered by grass species such as *Agropyron*, *Stipa* and *Bromus* and thorn cushion plants including *Artemisia*, *Astragalus*, *Acantholimon*, *Onobrychis*, *Festuca* (in highlands) and many forbes. Many Aquatic plant species cover the wetlands and marginal lands. The Gorgan basin has a higher percentage of forest areas than other parts of Golestan Province. This is due to the presence of the National Golestan Park.

3.1.4 Land degradation and Flooding

Over the last decades, local people, loggers and private companies have degraded great areas of forests and rangelands. However there is no available data about the rate of land degradation, although degradation is evident from informed observation of the upstream areas of the Gorgan river basin. Recent reports indicate that land degradation has played an important role in flood events in Noshahr and Neka cities in Mazandaran Province as well as in Golestan province.

The most important reason for land degradation, in general, and deforestation and range degradation, in particular, are poverty and lack of proper enforcement. People are to some extent dependent on the forests and range lands and gather fuel woods and timber for domestic use. An inadequate distribution system for fossil fuels and population growth reinforces this. Cattle raising in the forests has been a source of income for villagers in marginal lands and deforestation used to create new arable land for agriculture. In addition commercial logging has become a lucrative activity. The conversion of natural riverbank vegetation and Gallery Forests, for agricultural purposes has also decreased drainage capacity and increased runoff.

For thousands of years, animal husbandry has been the main activity for people in mountainous areas of Iran. As a result of population pressure and a lack of alternative livelihoods, pastoralists have increased their livestock. This has resulted in a decrease in suitable rangeland species, the loss of vegetation cover and soil compaction.

Furthermore, conversion of range lands for dry-farming is a common activity in the high slope upstream areas.

All of the above mentioned activities contribute to flooding after heavy rainfalls, especially in the downstream area. Even the presence of an intensive forest area such as the Golestan National Park cannot prevent flood damage.

3.2 Water Resources.

3.1.5 The Flood

The distribution of rainfall in the Golestan Province of between 200mm and 850 mm, and the topography form a favourable environment for a relatively fair distribution of the catchment areas to the existing rivers. However, over 60% of the precipitation in the province is not exploited, mainly due to altitude and steep slopes.

The impact of the August 10 floods was felt hardest along the Doogh River, a tributary of the Gorgan River. The heavy rainfall resulted in runoff quantities too great to be confined in the existing low-water channels of the Doogh River. As a result the Doogh River sustained major destruction along its banks and rocks and debris blocked its channels over a stretch of 20 km. Several hydrometric stations were also destroyed.

The floodwater reached the Golestan Dam, which was at a low level and contained 10 million m³ and quickly filled the reservoir to capacity (86 million m³). The side spillway and two sluice gates were used to discharge the floodwater with a peak discharge of 3,017 m³/s. The sluice gates were opened after 12 hrs after the first flooding. Below the Golestan Dam the discharged water, exceeding the high water design flow (400 m/s) the 1970-71 floods with a maximum discharge recorded in Gombad-e-kavus of 129 m³/s. The dam had also been designed for the sedimentation of stored water before release down stream towards the Volshmir dam.

The Water Shed Management Department has carried out the construction of a significant number of check dams to store water, and to control flooding. The Water Shed Management Department also controls the issue of authorizations for ground water exploitation and controls loans given to the farmers to plant trees and alfalfa, to start tree nurseries, to terrace land and for the construction of check dams. Project studies are conducted within the Department itself apparently without the essential participation of the stakeholders including other technical local authorities and the beneficiating communities.

As for the watershed management structures, several dams, and irrigation schemes were damaged, including the Gheez earth dam up-stream. The mission was informed that the impact of the Gheez dam collapse was an insignificant contribution to the flood. The Provincial authorities had estimated 4% of the floodwater was released by its destruction. However the mission recognised that the flood wave from the Gheez Dam collapse must have been quite destructive.

3.1.6 Analysis and underlying causes.

The abnormal rainfall is beyond the probable maximum precipitation based on the past meteorological data, possibly associated with change in global atmospheric circulation pattern. Further the flood discharge was estimated as a one in 15,000-year flood. However, the geomorphological formation of the upper catchment and the decrease in vegetation coverage are considered to have contributed to a quick run-off of a larger magnitude, which caused quicker and larger flood peaks. The decrease in vegetation cover results from the cultivation of steep slopes and overgrazing of rangeland. These

are considered to be the contributing factors to the 10 August floods. As in similar cases of flash floods, there are few immediate measures to prevent damage, except to try to save loss of human life.

The heavy rainfall and ensuing flood were unusual for the area, at least in terms of severity. Indeed, the degree of knowledge and preparedness of the population, as well as the local authorities, was incompatible with the scale of the flood. It should be noted that the Caspian region of Iran has been subject to four major floods in the last few months (Bonjird, Ardebil, Golestan, and Ramsar).

Despite the absence of real data, the amount of sediments carried by the rivers is evidence of the continued degradation of the topsoil. The environmental conditions in the region are changing. It is time to move on to an integrated approach capable of increasing the efficiency of the existing human and financial resources. The main objective would be to implement some form of sustainable development with the minimum possible degradation of the environment. The objective would be to stop or at least reduce the magnitude of the damage caused by natural disasters, such as floods and droughts.

3.1.7 Problems To Be Addressed.

Damages to humans, crops, and property could be minimized within the flood plain of the river in consistency with the cost involved. Flood mitigation will always be a set of measures, which combined, could reduce the flood damage.

There is an urgent need for some measures to be implemented on an emergency basis to reduce the impact of future floods. Where feasible, these immediate measures should be always seen within the context of the integrated approach and discussed with the various stakeholders prior to implementation. Urgent activities include the clearance of debris and rocks that block the channels of the Doogh River in over 20 kms inside the National Park, the re-establishment of the destroyed hydrometric stations and increasing their number to cover new areas, and the rebuilding of the destroyed bridges and culverts.

4.2 Human Settlements and Land Use

3.1.8 Situation and impact of the floods

The heavy rainfall and the resulting torrents, swollen rivers, and floods have had a substantial damaging effect on rural infrastructure and housing.

In terms of human settlement and land use this has resulted in:

- Total damage to houses: 70 billion Rials
- Two towns and 27 villages were affected
- Number of houses completely destroyed: 1872
- Number of houses damaged: 1607
- Number of bridges destroyed: or severely damaged: 23

The reaction of the authorities was swift and efficient. Within days the authorities commenced the assessment of damage in the affected towns and villages, and the restoration and repair of rural infrastructure, power, water supply and communications. These immediate actions were followed by structural repair and reconstruction. Tents were provided by the Iran Red Crescent Society and UNHCR to assist the affected population. The authorities also initiated a special loan programme in order to facilitate

self-help and self-organized reconstruction and the repair of housing. To date about 70 billion Rials have been made available in the form of soft loans to be issued for the repair and reconstruction of damaged and destroyed houses. In addition the Imam Khomeini Relief Committee, UN agencies and other organisations have contributed substantially. In many cases the most vulnerable families have received assistance in the form of new houses.

Many access roads, bridges, lines of communication and other types of infrastructure have been destroyed. Even well designed bridges, culverts and other types of infrastructure works, consisting of relatively expensive, solid structures of reinforced concrete, were swept away by the torrent.

3.1.9 Analysis and Actions

Human Settlements and Land use

Over the last 20-30 years flood-prone areas have increasingly been used for residential purposes. This is mainly due to the fact that the remaining area of vacant land in villages and towns became scarce, with the result that the poorer members of the community started to construct their houses on vacant, cheaper land, along the riverbanks. In general, poorer families occupying these low-lying areas do not have the means to construct a flood resistant structure and the force of the floodwater, therefore, had a damaging effect on these dwellings.

It is virtually impossible to protect the villages by constructing bunds or dikes along the river and the most suitable solution therefore, is to relocate all affected houses to higher grounds. Although the recent floods were exceptional in size and force, additional relocation of vulnerable communities is necessary because it is clear that the discharge capacity of the rivers has substantially been decreased and with subsequent heavy rainfall floods will most probably occur.

As the over-arching goal is to prevent the loss of human life, immediate actions should be undertaken. It is therefore vital that the authorities prevent settlements being built in flood-prone areas. Already rehabilitation and reconstruction of damaged houses alongside rivers has started and the relevant authorities should take immediate action to stop this. Suitable locations for human settlement have to be identified and prepared as soon as possible. These locations have to be subdivided and equipped with the basic infrastructure - community participation in the planning process is vital.

Subsequent sections of this report advocate for a holistic and comprehensive approach to the entire watershed area to address floods and their underlying causes. An important element of such an integrated approach is a land use plan covering human settlements. A number of plans exist and considerable expertise is available in the various departments and local authorities to enable such a plan to be prepared. Enforcing such a plan, is a different issue altogether, and requires adequate support and control mechanisms to ensure its success.

The floods provide an opportunity for the authorities to draw up and enforce planning and land use regulations to prevent settlement in flood-prone areas. An effective way of reaching this objective however is to create awareness among the target communities with a strong element of community participation in the design, planning and implementation of the programme.

Sustainable and feasible land use planning – including relocation or resettlement planning – should be based on an multi disciplinary, integrated, cross-sectoral planning methodology covering a whole range of issues related to recovery and development.

As part of an overall land use plan, area development plans should be prepared for specific geographical areas. This planning process entails developing relationships with all stakeholders: national and local authorities, NGOs, community associations etc. This also requires an extensive observation and investigation of the socio-economic conditions in the rural areas. The successful redevelopment of human settlements in this participatory way will require the full support of the authorities and communities and can only be achieved with a strong determination and political will to change attitudes and to succeed.

Infrastructure

Although the infrastructure works that were destroyed generally were well designed, well built and of a solid nature, they could not withstand the violent flow of the water. It is advisable to consider constructing infrastructure works of a more appropriate, simple nature and at lower costs. Reference in this respect is made to, for instance, Irish Crossings, simple culverts and protection by means of gabions. In normal circumstances these types of infrastructure serve their purpose and in case of excessive floods and damage they are easily replaced against much lower costs. These more appropriate and simple types of infrastructure also open the possibility for the community to be involved in the construction process, thus creating a sense of community ownership, which in turn, is crucial for creating a sense of responsibility for maintenance.

Housing

Soft loans are being provided to the families who have lost their houses. It should be ensured that these families do actually have access to these loans and assistance, – by for instance the housing department. Many families are still living in tents and the winter is fast approaching – the first snows have fallen on the mountains. With the winter in sight, immediate measures should be taken to provide these families with more appropriate shelter. Experience shows that often the affected families cannot dedicate all their time to the construction of their houses, and, often lack the skills to build the houses themselves. Contractors, therefore, need to be employed, despite the fact that in rural areas with only a few contractors available, the building costs will rise. The housing department has to take measures in the form of making building materials available (preferably on site) and offer technical assistance should families decide to embark on a self-help construction process.

Another option is to construct community buildings, which serve as temporary shelter for the winter for those families that have not been able to have a house constructed in time. At a later stage these buildings can be turned into schools or can serve other purposes (health care centre, administrative building, meeting place, etc.)

5.2 Disaster Response and Management

The heavy rainfall that occurred on Friday 10 August fell over a twelve-hour period. However, given the intensity of the rains the flood surge moved through the forest campsites and the villages below the forest at a very rapid rate and provided little time for warning. Information available to the Golestan Disaster Task Force appears to have been limited to rain forecasts from the National Meteorology Organisation in Tehran. These do not appear to have indicated to the Golestan Disaster Task Force the anticipated intensity of the rain or the probability of a substantive and extensive flash flood. Authorities in Golestan were not able to directly monitor the rainfall at stations in the catchment area. No monitoring appeared to be carried out of the river flow.

Although the Golestan Disaster Task Force provided warning of the storm and the potential for flood this appears to have been disregarded or not heard by the affected

communities. A number of villages questioned appeared to have observed the rising waters and taken action accordingly. In one case this was with unfortunate consequence as people attempting to escape the floods in a tractor drove too close to the flooded river and were killed when the bank collapsed. It would appear that people camping in the forest received no warning and were not clear as to what action should be taken when the rising waters were observed.

However inadequate the early warning of the flood might have been the Golestan Disaster Task Force appears to have swung into action quickly to undertake search and rescue, immediate clear-up and opening of roads and to provide immediate relief to affected populations. In the immediate relief and rehabilitation phase the DTF was able to mobilise support from the national government, the international community and other Provinces in the Islamic Republic of Iran.

There is a clear need for improvements to the flood early warning system in Golestan. This will require the development of more effective monitoring systems of river flows and rainfall, improvements in the transmission of warning messages to potentially affected communities and awareness raising with communities in the river basin on early warning and action to be taken in the event of a flood.

3.2 Institutional Arrangements

An overview of the structure of Government departments in Golestan is provided in Annex IV. Two sectors however, are elaborated further in this section because of their importance to the mitigation of floods and to watershed management.

Water Resources: The Management of the water resources of Golestan province falls under two departments, the Water Resources Department, and the Watershed Management Department.

The Water Resources Department reports to the Ministry of Energy, and is responsible for the management and development of the riverbeds, and the distribution of water. It has been actively involved in the improvement of the River Gorgan mains and tributaries, and in the storage and distribution of its waters. This includes the planning and construction of water dams. Following the completion of the 86 million cu.m capacity Golestan I dam, construction of Golestan II dam has already started. Four other dams are still under different stages of study.

The Water Resources Department is also charged with monitoring hydrological data, including rainfall, and river sedimentation rates. The comparison of such data throughout the years is indicative of soil degradation, vegetation reduction, and other phenomena considered as elements conducive to floods.

The Water Shed Management Department, reporting to the Ministry of Agricultural Jihad, caters for the management of water resources for agricultural purposes including irrigation schemes and construction of check dams for storage and distribution of irrigation water. The Water Shed Management Department also controls Ground water through being actively involved in the process of licenses and loans for ground water exploitation projects.

It should be noted that while the provincial Development committee, of the Governor's office is charged with coordination of activities and budget allocation; policy and project planning is carried out centrally in Tehran.

Natural Resources: Administratively, the management of natural resources in I.R. of Iran is mainly conducted by Forests and Range lands Organization under the supervision of the Ministry of Agricultural Jihad, and the Department of Environment under the supervision of a Presidential body. The DoE is responsible for conservation, protection and rehabilitation of **unique habitats** through the establishment and management of National Parks, Protected areas, Hunting Forbidden Areas, Wildlife Refugees and National Monuments. FRO is mainly responsible for conservation, protection, utilisation and rehabilitation of forests and rangelands throughout the country. For any utilisation/rehabilitation of forests and range lands, FRO must prepare a management plan in the framework of a forestry or range management plan. Over the last few decades, FRO has been handing over the implementation of such forestry plans to private companies and local Co-operatives. Cattle raising in the rangelands is also undertaken under the supervision of FRO, but range improvement activities must be undertaken within the framework of a management plan. At the provincial level, DOE and FRO have their own departments.

4 CONCEPTUAL FRAMEWORK

4.2 Problem Analysis

The short-term rehabilitation needs of the flood-affected areas have been largely successfully assessed and undertaken by government agencies. The mission, through visiting the affected area and talking to communities and authorities, has identified some gaps in the rehabilitation process with which it is proposed UN agencies can assist. These proposals are addressed in sections five and six of this report.

In Caspian Provinces of Northern Iran, particularly in the last few years local heavy rainfall has resulted in flooding with devastating effects on the population, infrastructure, agriculture and other socio-economic activities. The recent flooding in Golestan Province is an example. An increasing rural population, increased population pressure on land use, overstocking of farm animals, reliance on increased technology, the over-exploitation of the forests, and intensive agriculture to solve the problems of food production have contributed to exacerbating the problem. To solve the problem in the long term all the components of the complex need to be addressed in what is proposed as an 'integrated approach to water basin planning and management' See flow charts 1 and 2.

The perception of the mission is that at the community level there is little or no informed decision making and no community participation in the decision making process whilst at the national and provincial institutional level there is little or no accountability or responsibility for decisions being taken on the communities behalf. In addition, institutionally there is no collective vision of how to solve problems in the long term. In general, technology is used to make short-term interventions to alleviate what are perceived as short-term problems. The mission feels that institutions have difficulties addressing either the causes or the long-term solutions to the problem. Included in the mission's proposal to change the status quo is the need to provide a less vertical and more horizontal approach to management and institutional structures with regard to problem solving.

To change the status quo will require from the authorities a great deal of political will and a paradigm shift in how problems are perceived, identified, addressed and solved and the formation of appropriate bodies to bring about the changes necessary. An equal effort will be required at the community level to involve their participation and to ensure that the ownership and responsibility for solving problems at village level is that of the communities. At livelihood level, for example, there is the basic problem of developing and implementing an appropriate level of agricultural technology.

The sensitisation of the population including provision of information on best practices of agriculture, and land use should be considered and studied in depth. The population's understanding of the root causes of floods could help in a general culture of environment preservation and reduction of flood occurrence. How the population participates, is motivated to receive this information and in what form, and by what structures is a major challenge for the stakeholders in the process. Moreover, the process of identification of capable leading groups within the communities will facilitate the simple and direct process of alarming the population in the eventuality of a flood, an earthquake or similar natural disasters.

5.2 Approach

Following on from the analysis of the problem, the mission proposes that the solution to the management of the problem of long-term flood prevention in Golestan Province can be achieved through an integrated water basin planning and management programme in which all relevant sectors and stakeholders are involved and participate. Annex VI provides a detailed conceptual framework for integrated water basin planning and management.

The overriding concept being put forward by the mission includes four key elements:

- That communities will be responsible for identifying and solving their own problems and will be given the assistance and means to do this. Government departments and institutions along with community-based organisations will be responsible and accountable for enabling the communities to carry out their responsibilities and for establishing a framework within which communities can work, accept and play their new role. They will also be given the assistance and means to do this.
- That all Government departments and organisations should be involved in a holistic approach to watershed management. Rather than have responsibility for the overall problem divided between departments an overall vision on addressing the problem would be acted upon by departments working together, and with communities, in a task orientated holistic approach.
- That the management of the river basin would consider both the direct uses made of water resources and the human activities taking place within the basin. This requires the balancing of potentially conflicting demands.
- That greater emphasis is given to ecological/environmental/biological solutions to watershed management than the current emphasis on structural and technological solutions.

The objective of this approach is mutual development at institutional and community level to achieve the long-term sustainable solution of a problem of flooding by empowerment at community level and capacity building in government departments. The role of the UN is to assist all parties to arrive at the new level through training and technical assistance. There is no easy path to achieve this goal and the mission felt this to be new ground for Iran. The UN has experience from many countries in the world of institutional change, management of change and of community participation and empowerment. The UN can use this experience and expertise to achieve the desired end.

5 REHABILITATION OF THE DOUGH RIVER BASIN

6.2 Goals and Objectives

The overall goal is the rehabilitation of people affected by floods in the Doogh River Basin and the reduction of vulnerability to future floods.

5.1.1 Objective 1: To ensure that those who remain seriously affected by the floods, particularly in terms of housing and services, receive prompt assistance.

5.1.2 Objective 2: To identify and reduce immediate future flood risk

7.2 Assistance to those affected by floods: housing and services

As mentioned earlier in this report, ample assistance from various sources is being provided. There are however, several areas requiring closer attention:

Loans: The mission perceived a need for the authorities to improve access to loans. Often rural farmers are not familiar with all kinds of financial arrangements and assistance is required to help them to cross the threshold to obtain a loan. Attention also should be paid to the fact that in general the poorer families have been affected by the floods since it were especially these families that occupied plots closer to the river bed. These families will have difficulties in obtaining and repaying loans and additional assistance by the relevant departments is required in terms of extending loans, provision of grants where appropriate and enabling better access to loans and grants.

House construction: The authorities should immediately start with surveying the villages along the riverbanks and make sure that no houses are being built in flood-prone areas. In many cases relocation will be a necessity and plots will need to be made available. This process should – even in the present rehabilitation phase – be based on direct participation by the beneficiaries.

Self-help or self-organised house construction is in these circumstances generally considered the best possible option to replace the damaged houses. However, only a few months are left before the onset of winter. The authorities can facilitate and speed up the construction process by providing building materials and additional technical assistance. In some cases it might also be possible to embark on the construction of larger buildings that can temporarily serve as shelter during the winter and later on can be turned into community buildings.

5.1.3 Rural Infrastructure Rehabilitation

The Authorities have started the reconstruction of infrastructure, and the rehabilitation of services and lines of communication is well underway. It is worth considering, however, more appropriate and simple types of rural infrastructure, which are cheaper and which can be more easily replaced if they are destroyed.

Reconstruction and rehabilitation is an automatic response to damage and destruction. It is advisable, however, to investigate whether in all cases reconstruction actually *is* required. In some cases a more in-depth inspection of the situation might reveal that there is no direct or urgent need for repair or reconstruction and that other solutions are applicable.

5.1.4 River Rehabilitation

There is an urgent need for some immediate recovery measures in advance of the oncoming winter season to mitigate against future floods. The Government should take immediate steps to:

- Re-establish destroyed hydrometric stations, and the installation of other equipment necessary for monitoring and early flood detection.
- The clearance of debris and rocks blocking the channels of the Doogh River inside the National Park, and the rebuilding of the destroyed bridges and culverts.

5.1.5 Identification and Removal of Immediate future flood risks

After the flood in August 2001, rehabilitation work in the Golestan Province involved the transfer of villages seriously damaged by the floods to areas with lower flood risks. Many other villages and associated agricultural and fisheries activities are, however,

believed to be located in flood risk areas. Considering that the next flood season will start in spring 2002, and rehabilitation of hydraulic structures is under way, immediate action will be needed to identify, mitigate and reduce potential risks of flooding in the Doogh River basin.

It is estimated that such risks are highest particularly in the flood plains (settlements, agriculture and fisheries), and areas, which suffered from debris flows and which might be susceptible to future debris flows in case of high precipitation. As an initial step the rapid identification of immediate future flood risks should be carried out throughout the Doogh Basin. These risks will be particularly relevant for flood plain agriculture (particularly, rice cultivation), human settlements in flood plains, aquaculture, forests in the Golestan National Park, and the flow of debris affecting particularly agriculture and housing.

This initial action of rapid identification of future risks of flooding will be carried out:

- (i) based on the existing maps on topography, geology, land use and precipitation distribution;
- (ii) by field survey, particularly taking into consideration damage to the hydraulic structures and changes in topography by the August 2001 flood; and
- (iii) through community participation.

The target output of this initial action is a flood risk map, prepared by the Provincial DTF with support from relevant Provincial level ministerial organizations (DOE, FRO, MOE, MOAJ, FO and Ministry of Roads and Transport).

It is estimated that this initial assistance will cost around US\$30,000 for the duration of two months. Additional budget funds may be secured from the Government to mitigate and/or reduce these identified flood risks.

6 INTEGRATED WATER BASIN PLANNING AND MANAGEMENT FOR THE GORGAN BASIN

8.2 Goal

Flood Mitigation through an integrated and holistic approach to the planning and management of the Gorgan Basin.

9.2 Strategy:

Based on the knowledge on recent floods the underlying causes and lessons learnt, the mission proposes that the UN assist the Governorship of the Golestan Province in developing a mechanism to plan and develop an integrated Gorgan river basin management programme. This will be through inter-ministry coordination and involving the participation of a wide range of stakeholders. In establishing such an integrated programme the mission proposes that the UN support and advises the Provincial Government on the development of an integrated management plan for the Gorgan River; undertake pilot activities with an ecosystem approach to agro forestry, agriculture, community development and family planning; public awareness and capacity building; and disaster risk and vulnerability reduction.

10.2 Objectives

6.1.1 Objective 1: Integrated Planning and Management

Assist the Government in development of an integrated Gorgan River basin management plan through an inter-ministerial mechanism and involving a wide range of stakeholders by providing technical advice in relation to integrated river basin planning and management, particularly in the field of water resources development, agricultural practices, forestry, animal husbandry, so that the efforts of the Government will be facilitated.

6.1.2 Objective 2: Pilot Activities

Develop and implement pilot activities to demonstrate effectiveness of innovative approaches and measures, particularly in the fields of agro-forestry, soil and water conservation, animal husbandry; water resources utilisation, renewable energy and community development and involvement.

6.1.3 Objective 3: Enhance public awareness

Enhance public awareness and promote education and extension in sharing lessons, disseminating underlying causes, promoting ecosystem approach and ecological measures

6.1.4 Objective 4: Risk Reduction and Vulnerability Reduction

Reduce the vulnerability of villages and people to future flood and drought by strengthening the capacity of provincial government and communities in the Gorgan basin for enhanced disaster risk management. This would be achieved by supporting community disaster reduction activities.

11.2 Development of an Integrated River Basin Management Plan for the Gorgan River basin

6.1.5 Background:

A need for an integrated approach to river basin management in the Gorgan River basin is emphasised as an important step to mitigate, and enhance preparedness, for future floods. Under the institutional arrangements to address a wide range of issues involved in the river basin, a strong need was recognized to reinforce institutional coordination and cooperation to address issues related to issues in the river basin so that river basin management efforts by relevant sectors will be carried out in an efficient and cost-effective manner.

Development of an Integrated River Basin Management Plan for the Gorgan River Basin, to be carried out through an inter-ministry mechanism, is perceived as an critical initial step to build an integrated river basin management schemes for the Gorgan River Basin to be developed over a longer period of time. Once successfully implemented, the plan and its development and implementation mechanism will be used as a model for other river basins in the I.R. Iran.

For the preparation of the Integrated Gorgan River Basin Management Plan (IGRBMP), it is proposed to establish an Inter-ministerial Task Team (ITT) at the Golestan Province level mainly comprising of Governorship (DTF), Department of Environment, FRO, Ministry of Agricultural Jihad, Fisheries Organisation, Water Resources Organisation of the Ministry of Energy, Ministry of Roads and Transport. Since Khorasan and Semnan Provinces also share the Gorgan River Basin, in this ITT, key organisations in the Khorasan and Semnan Provinces will also participate, so that necessary inter-Provincial cooperation will be obtained through their participation in the ITT. Further in this process, a wide range of stakeholders will be involved in the process of the Integrated Gorgan River Basin Planning and Management, including NGOs active in the Provinces, and selected members of the village communities and cities.

6.1.6 Expected output:

- Report of the diagnostic study of ecological resources and functions, and socio-economic conditions of the Gorgan River Basin;
- Ecosystem-based land use planning report and associated maps;
- Fully developed Integrated River Basin Management Plan prepared through the ITT with participation of a wide range of stakeholders; and
- Reports of a series of stakeholder consultation meetings on the development of the IGRBMP.

6.1.7 Activities:

- Establishment of the Inter-ministerial Task Team at the Golestan Province level and organisation of a series of ITT meetings to oversee the process.
- Conducting a diagnostic study on ecological resources and functions, and socio-economic conditions of the Gorgan River Basin;
- Evaluation of land potential and carrying capacity for the Basin, using land potential and carrying capacity evaluation models that exist;
- Carrying out of a scenario study for the development and the environment for the River basin;
- Recruitment of local consultants to draft the IGRBMP;

- Carrying out a Strategic Environment Assessment to evaluate the impacts of the Gorgan River basin management policy;
- Organisation of a series of stakeholder consultation meetings, at the initial stage of development of the IGRBMP, at the time when the first draft is prepared, and upon completion and adoption of the IGRBMP;
- Publication of the IGRBMP both in Farsi and English; and
- A regional and/or national workshop to sensitise the IGRBMP and its development process.

6.1.8 Budget and duration:

- Organisation of the ITT; US\$20,000
- Local consultants; development of a diagnostic study (US\$12,000; 8 p/m);
- Evaluation of land potential and carrying capacity (US\$10,000; 6 p/m);
- Scenario study (US\$10,000; 6 p/m);
- Drafting of the IGRBMP and Strategic Environment Assessment (US\$10,000; 6 p/m) – Sub-Total Local Consultancies: US\$42,000;
- Stakeholder consultation meetings: five meetings; US\$5,000 for each consultation – total US\$25,000
- Publication of the IGRBMP and other reports, including translation: US\$9,000
- Regional/national workshop: US\$20,000
- International consultancy (6mm @ USD12000) –USD72, 000

Total: US\$173,000

12.2 Pilot Activities

Develop and implement pilot activities to demonstrate effectiveness of innovative approaches and measures, particularly in the fields of agro-forestry, soil and water conservation, animal husbandry; water resources utilisation, renewable energy and community development and involvement.

6.3.2.1. Background

One of the most important reasons for land degradation in Gorgan river basin, like many similar parts of Alborz Mountains, is poverty due to the lack of alternative livelihoods among local communities. In other words, they have to degrade their environment because they do not have any other choice. In the framework of an integrated watershed plan, develop and implement sustainable pilot activities to demonstrate effectiveness of innovative approaches and measures, must be considered. Such an activities will particularly focused in the fields of agro-forestry, soil and water conservation, animal husbandry; water resources storage and utilisation, renewable energy and community development and involvement.

Using community involvement, government will be able to change the current destructive low-efficient agricultural activities to an integrated sustainable system, which can increase the life conditions of the villagers and rehabilitate the degraded areas for rational utilisation of natural resources and prevention of future floods.

For achieving the goals, inter co-operation between all stakeholders and especially governmental organisation must be properly designated. In this regard, Ministry of

Agricultural Jihad, Forests and Rangelands Organisation, Management and planning Organisation, Department of Environment, Ministry of Road and Construction, both in national and provincial levels, will play an important role. In the national level, it is necessary to establish a special committee for making strategies and finding some financial/technical support for proper implementation of agricultural and animal husbandry activities of integrated watershed management action plan.

6.3.2.2. Expected output

- Increasing of the total productivity of sloppy dry-farmlands as well as decreasing of soil erosion and land conversion
- Decreasing of the pressure of overgrazing and over harvesting on the forest and rangelands
- Rehabilitation of degraded areas and improvement of total productivity of forests and rangelands
- Establishment an effective storage and management of water resources related to agriculture
- Increasing of the total incomes of the villagers as well as pastoralists
- Enhancement of community involvement in designing, planning, programming and executing of the activities related to agriculture

6.3.2.3. Activities

- Recruitment of a national consultant
- Selection of the suitable sites for execution of the pilot projects in Gorgan river basin by MOAJ and FRO
- Identification of the beneficiaries for implementation of the pilot projects by the Government (esp., MOAJ and FRO)
- Preparation of detailed work program for each pilot project
- Discussion and agreement with beneficiary groups of the terms for provision of materials and establishment of agreements
- Organization of the villagers for the execution of works under supervision of Governmental Authorities
- Procurement of materials according the quantities and technical specifications
- Implementation of the following pilot projects in the selected areas:
 - Agro-forestry (fruit saplings + Alfalfa) in 6000 ha of sloppy dry-farmlands in upstream
 - Rangelands improvement activities in 1500 ha of the upstream areas
 - Establishment of 3 stations for implementation of following demonstration activities:
 - Semi centralized animal husbandry
 - Sprinkle and drip irrigation systems
 - Silkworm culture
 - Apiculture
 - Cultivation of medicinal plants
 - Biogas and solar energy
 - Management of non-timber products from the forests
- Evaluation of the impacts of the pilot projects and preparation of a final report

6.3.2.4. Budget

- National Consultant: US\$ 8,000 (4 month)
- International Consultant: US\$ 6,000 (15 days)

- Inputs:
 - Agro-forestry: US\$ 370,000 (including seeds, saplings and fertilizers)
 - Range improvement: US\$ 20,000 (including seeds and fertilizers)
 - Demonstrational stations: US\$ 150,000 (for 3 stations)
- Direct operating costs: US\$ 30,000
- Total: US\$ 584,000

6.3.3. Objective 3: Enhance public awareness

Enhance public awareness and promote education and extension in sharing lessons, disseminating underlying causes, promoting ecosystem approach and ecological measures

6.1.8.1 Background:

Community involvement is one of the most important parts of integrated approaches, especially related to the conservation, protection and rehabilitation of natural resources and agricultural development. It seems that lack of environmental awareness must be considered as a main reason for low participation and involvement of the community in different stages of development in Iran as well as other developing countries. After ratification of the national act on Forests and rangelands in 1963, the right of ownership for forests and rangelands was completely affiliated to the Government. In spite of the fact that FRO and other Governmental organizations supposed to be responsible for protection and utilization of mentioned natural resources, local communities continuously considered themselves as the real owners of forests and rangelands in the areas that they are settled. Because there are many actors involved in the management of the natural resources, it is quite necessary to establish an agreement among them for fairly distribution of total benefits in the framework of sustainable practices with strong emphasise on community involvement.

It is clear that the current disagreement between villagers/pastoralists and the Government led to higher degradation of natural resources and future disasters such as flood events. At the same time, we believe that rational and sustainable management of natural resources can be achievable with close co-operation of local communities and Governmental Organization and it needs a holistic training program for both sides.

Brilliant background of the governmental organization such as Ministry of Agricultural Jihad (the former Ministry of Jihad –e-Sazandeghi) in rural development must be considered as a good opportunity for extension of the concept of sustainable development in the framework of integrated watershed management action plan in Gorgan river basin. Proper designation and implementation of IWMP needs training, at first for the MOAJ/FRO/DoE's experts and then for local communities.

6.1.8.2 Expected output:

- Enhance public awareness and promote education and extension in sharing lessons
- Dissemination of underlying causes of the natural disasters, especially flood
- Promotion of ecosystem approaches and ecological measures for sustainable utilisation of natural resources
- Improvement of inter connections among stakeholders, especially Government and local communities

6.1.8.3 Activities:

- Environmental education on the concept of holistic or integrated approaches related to watershed management, agriculture, forest and rangeland management, animal husbandry, urban/rural/industrial development, etc. for related Governmental Organizations
- Training workshops for Gov. experts and local communities, especially leaders and educated people on aforementioned subjects
- Publications and dissemination of information related to environmental awareness among stakeholders

6.3.2.4. Budget:

- Environmental education (seminars & training courses): US\$ 50,000
- Training workshops (at least 3): US\$ 10,000
- Publications, etc.: US\$ 20,000
- Total: US\$ 80,000

6.1.9 Disaster Risk and Vulnerability Reduction

Reduce the vulnerability of villages and people to future flood and drought by strengthening the capacity of provincial government and communities in the Gorgan basin for enhanced disaster risk management. This would be achieved by supporting community disaster reduction activities.

Specific activities will include the provision of support to the Golestan Disaster Task Force in the implementation of a community disaster reduction programme and in the improvement of early warning mechanisms.

6.1.10 Background:

After the flood in August 2001, rehabilitation work is underway in Golestan Province. However, it is understood that people are still living in flood prone areas (such as flood plains) or human activities are taking place where flood damages may be expected in the immediate future. It was also observed by the mission that debris flows caused by torrential rain during the period, caused damages to housing, agricultural land and rangeland.

It is concluded that people live in areas that are vulnerable to impacts of natural disasters, including floods, droughts, debris flows and earthquakes, and as a short-term to mid-term measures, such vulnerability of civil life and human activities (agriculture, fisheries, housing and public infrastructure) should be identified/assessed and removed by, e.g., transferring villages, improvement of flood mitigation structure, improvement of flood warning system, etc. It was pointed out that climate conditions are difficult to predict based on meteorological data. It is possible that frequent flooding may occur in the Gorgan River basin and adjacent river basins in the Province.

In order to incorporate such vulnerability reduction into the currently ongoing rehabilitation work and the proposed integrated river basin planning and management, it is of urgent importance that such vulnerability to natural disasters will be identified

and assessed, so that the Government will be able to give priority to the most vulnerable areas, for immediate assistance.

6.1.11 Expected outputs

- A report of vulnerability of human environment (including housing, civil life, productive activities such as agriculture and fisheries) to natural disasters (floods, debris flows, earthquakes and droughts) for the Gorgan River Basin, accompanied by a series of GIS vulnerability maps.
- Reports on community-level vulnerability reduction plan in preparation for future natural disasters
- A Community Disaster Task Force established and operational providing a specific initial focus on the Gorgan basin;
- A strategy for sustainable disaster reduction at the community level developed;
- Community 'focal points' identified in some six villages;
- Implementation of community disaster reduction strategy underway.
- Undertake a review of the early warning provided to communities prior to the August floods to identify ways in which the early warning mechanism and communications can be improved
- A plan of action prepared for improving the early warning mechanisms to the villages of Golestan;
- Training for improved early warning conducted with appropriate government departments and with village leaders.
- Activities:
 - Organisation of a basin-wide workshop on future natural disasters, lessons learned from the recent drought and floods and vulnerabilities existing in the basin;
 - Organisation of community-level meetings to identify vulnerability to future natural disasters;
 - Carrying out of an assessment study on vulnerability to floods and other natural disasters on a Gorgan River Basin scale, so that current and future rehabilitation work will be based on removing identified and assessed vulnerability of civil life and human activities; and
 - Development of a series of GIS maps indicating vulnerability in the Gorgan River Basin in different sectors; and
 - Organisation of a basin-wide workshop to indicate vulnerability of people and human activities to flood and other natural disasters.
- Skill development and co-operation with government remote sensing unit
- Establish community Disaster Task Force – a joint government-community planning body for cooperation in disaster reduction activities (ensure participation of women's organisations)
- Identify training needs in the area of community disaster reduction and develop training programmes for Disaster Task Force, local NGOs and Community based organisations;
- Assess the needs and identify priority areas for community disaster reduction activities in each participating village;
- Develop a village specific strategy for community disaster reduction;
- Identify implementing arrangements
- Adopt the strategy in each village.
- In consultation with the members of the Community Disaster Task Force, identify "community focal points" where appropriate – with operational functions;
- Implement training programmes at the provincial and community level;

- Identify and formulate a programme of activities at the community level which corresponds with the village strategy;
- Prepare guidelines for the undertaking of the review;
- Review early warning procedures and practice through meetings in a selection of flood affected villages;
- Identify the strengths and weakness in the current practice and provide recommendations for improvements.
- Formulate and implement an early warning mechanism programme to strengthen early warning at the provincial and community levels.
- Prepare a training course on "early warning mechanisms" prior to disaster.
- Undertake training in selected villages and with appropriate government departments.

6.1.12 Budget

- US\$24,000 (local consultants);
- US\$6,000 (organization of community-based vulnerability identification);
- US\$25,000 (purchase of remote sensing data);
- US\$20,000 (community-based vulnerability reduction plans); and
- US\$45,000 (organisation of two basin-wide workshops and other training).

Potential actors and stakeholders: The Golestan Province Governorship (Ministry of Interior), MOAJ, FRO, DOE, Fisheries,

7 THE ROLE OF THE UN SYSTEM IN RECOVERY AND REHABILITATION

Immediately after the floods, UNDP/UNICEF fielded a mission to assess immediate relief need for the flood stricken areas, particularly in the Doogh catchment area. Further, UNDP Administrator expressed UNDP's commitment to assist the Government of I.R. Iran in the rehabilitation process and decided to field a mission to assess rehabilitation needs for medium to long-term river basin management as a view to enhancing preparedness for future floods.

UNDP called for a wide participation of the United Nations programmes and organisations in this proposed mission, and a UN Inter-agency Mission was fielded with participation of UNEP and FAO, led by UNDP.

The UN agencies and organisations are expected to play specific roles in the UN-wide assistance to the Government of I.R. Iran in the implementation of the proposed follow-up activities, and where necessary and requested, specific technical assistance and advice may be provided to the ongoing efforts of the Government in the areas relevant to flood damage recovery and integrated river basin management.

Among the UN Agencies, specific roles of relevant UN agencies and organizations in such UN-wide assistance are preliminary proposed, as below, and extension of wider participation of other UN agencies will be explored and identified. Further, it is also expected the Government of the I.R. Iran will express its political and financial commitments to the proposed follow-up activities, so that participation of the UN agencies and organisations will be facilitated and promoted.

United Nations Development Programme (UNDP)

UNDP's country programme is closely linked with following priorities:

- Equity – Poverty alleviation and sustainable human development
- Efficiency – economic and resource-based management, including environmental conservation
- Empowerment – Governance and participation of civil society
- Cross-cutting and special programmes including information technologies, disaster response and preparedness, and regional programmes

In the proposed UN-wide assistance, UNDP will play an inter-agency coordination role in the UN-wide follow-up to the assistance to the Government of the I.R. Iran and the Governorship of the Golestan Province. UNDP Tehran will be a UN focal point for the Government of the I.R. Iran (DTF in the Ministry of Interior) and the Golestan Province (Governorship).

UNDP has pledged US\$400,000 in support of the proposed follow-up, and its support will possibly cover immediate rehabilitation needs and pilot conservation activities with a main emphasis on community involvement (Annex VII contains an outline of a proposal for the use of these funds;

Community-based vulnerability and risk mapping; immediate assistance to those affected by the August flood, income generation and poverty reduction.

United Nations Environment Programme (UNEP)

UNEP has played a catalytic role in coordination of activities for the protection and management of a wide range of “environment”. In the environmental emergency and technical cooperation programmes, UNEP has assisted Governments in establishing ecosystem-based integrated river basin assessment and management, and assessment and reduction of environmental vulnerability to floods and other natural and human-induced disasters.

In the follow-up activities, UNEP is proposed to provide technical assistance and/or advice to the development of the Integrated Gorgan River Basin Management Plan and to vulnerability mapping and assessment from environmental perspective.

Food and Agricultural Organisation of the United Nations (FAO)

Technical assistance in modification of agricultural practices and livestock raising, so that these activities will not exceed ecosystem carrying capacities.

Other UN agencies

Other UN agencies, which may be interested in this UN-wide efforts, may include, but are not limited to, the following organisations:

- United Nations Population Fund (UNFPA) – population growth
- WMO – HYCOS – meteorological monitoring
- UNESCO – IHP and MAB – scientific activities and research on the biosphere reserve and hydrology, environmental education
- GEF-UNEP/UNDP/WB Caspian Environment Programme (CEP) – inclusion of river basin management into the Caspian Environment Programme

ANNEXES

1 ANNEX:TERMS OF REFERENCE

Background

On Friday, 10 August 2001, torrential rains triggered flash floods in the Golestan, Khorassan and Semnan provinces of Iran. The rainfall reached 450mm in the first 12 hours alone and peak flow in Gorgan River reached 3017 m³/sec. The cities of Kalaleh and Minoodasht and their surrounding areas (387 villages) in Golestan, Jajarm village in Khorasan Province and Miami and Hossein-Abad Kalpoush villages in Semnan Province bore the brunt of the flooding.

The flash floods in Golestan are the worst in 200 years. On the 20 August, 214 people were confirmed dead, 200 people had been injured and 200 were still missing. Overall, 271,796 people were affected, of which 10,000 are homeless. In terms of infrastructure 4,000 buildings are heavily damaged and road networks within the province and linking other provinces are seriously damaged. Electricity, gas, water and telephone services were cut for the affected areas but have now largely been restored. For agriculture 15,000 ha of farmland and 10,000 ha of forest and rangeland are destroyed. Financial losses for the province are estimated at 491 billion rials, or US\$61.6 million. There is a danger of malaria, diarrhoea, tetanus and rabies epidemics.

In Khorassan 14 people were confirmed dead, 20 missing. In Samnan, no casualty is reported. However, there are widespread damages to buildings, agriculture and horticulture.

The Government responded immediately with the provision of relief items that included food, cloth, blanket, tent and medicine. It also relocated 10,000 of the affected population to safe areas. Water, electricity, gas and telephone services were restored in most of the affected areas and roads have been repaired on an emergency basis. The Government has allocated 110 billion rials, or US\$13.75 million, for rehabilitation and has been allocating grants to those affected farmers who have no insurance coverage.

Following the disaster, the United Nations in Teheran was in immediate contact with the Government authorities to provide information through five situation reports. The UN also dispatched an interagency field assessment team to the worst affected areas and the Resident Co-ordinator wrote to all donor embassies with information on the situation. The Government has indicated its willingness to accept international humanitarian assistance.

The significant economic and social losses from the impact of the flooding require attention to measures that are both immediate and long term if the risk of future damaging events are to be reduced. FAO has indicated its intention of undertaking a mission to prepare a watershed management plan for the area. However there is a clear need for an integrated recovery and rehabilitation plan for the flood affected area.

Mission Objective

The Emergency Response Division of UNDP, in consultation with the Tehran Country Office, has agreed on the need for an integrated and comprehensive recovery and rehabilitation plan. It has therefore been decided to field a three to five person mission in September to visit this area. The objective of the mission is to assist the Government

of the Islamic Republic of Iran to formulate a strategy and framework for post flood recovery and rehabilitation in the flood affected areas of Golestan.

Mission Composition:

The team is likely to include the following personnel:

A recovery/development specialist - Team Leader

Agriculture/Livestock specialist

Natural resources management expert

Hydrologist

Community development/participatory development specialist

Activities:

The mission will undertake the following activities whilst in Iran:

- Briefing meetings with Government, UN and relief officials in Tehran to identify ongoing and planned recovery and rehabilitation activities, where they exist, and collect relevant materials (Days 1 to 2)
- Travel to affected area in Golestan (Day 3)
- Meetings with Governor and other local officials (Day 4)
- Visit to affected areas (Day 4 and 5)
- Follow-up meetings with local officials (Day 6)
- Return to Tehran (Day 6)
- In the activities above the mission will:
 - identify what actions have been taken so far, what programmes and activities are planned; review capacities, weaknesses and gaps.
 - identify action that will be required to ensure the recovery and rehabilitation of the affected areas in a way that will reduce future risk to floods and drought.
 - identify the potential role that UNDP can play in the post flood recovery and rehabilitation
 - identify any further technical studies that might be necessary for effective recovery and rehabilitation.
- Preparation of draft Report (Day 7 to 8)
- Debrief with UNDP and Iran Government (Day 9)
- Meetings with Donors to present draft report and identify potential support for the recovery and rehabilitation programme (Day 9).
- Finalisation of Report (Day 11)

Output of the Mission:

The mission will provide to the UNDP Country Office and the Ministry of the Interior of the Islamic Republic of Iran a detailed report. This will provide a detailed analysis of the causes of the flooding, a framework for post-flood recovery, strategy and plans for implementation by the Government and a budget.

Duration

The mission is expected to spend ten days in Iran with four days in the field. The mission will be undertaken in September as people living in the flood-affected area are approaching winter.

2 ANNEX: PROGRAMME OF VISITS FLOOD RECOVERY MISSION

Monday, 15 October 2001 (23 Mehr 1380)

11.00 Meeting with Messrs. Seyed Abbas Jazayeri, Director General, Bureau of Studies for Coordination and Safety-Rehabilitation Affairs and Disaster Task Force, Hassan Azadeh, Expert of the DTF/MOI Tehran, and Reza Ahamdi, Expert of the DTF Golestan Province- at MOI

Tuesday, 16 October 2001 (24 Mehr 1380)

12.00 Travel to Gorgan, Golestan Province by plane
18.00 Meeting with Mr. Pajouhesh, Deputy, Political & Security Affairs at the Governorship-General of Golestan Province, and other Provincial Authorities and Technical advisors

Wednesday, 17 October 2001 (25 Mehr 1380)

07.00 Meeting with Mr. Khosravi, Governor of Minoodasht, (Field Trip), Along the Doogh River, the Goestan National Park, the Dasht dam, Beshoili Village, meeting the local committee, accompanied by Experts from the Province
10.00 Meeting with Mr. Ahmadi, Expert of the DTF Golestan Province- at MOI (Mr. Takehiro Nakamura OCHA/UNEP and Mr. Ali Nouri FAO joined the team)

Thursday, 18 October 2001 (26 Mehr 1380)

07.00 (Field Trip) the pumping station in the town of Gonbad-Kavous, the Golestan Dam, the Town of Kalaleh, Afforestation near the village of Balouchabad-e-kogcheh, a small dam in the village of aBalouchabad-e-kogcheh, accompanied by Experts from the Province
14.00 (Field Trip) Mr. Nakamura, Mr. Nouri, Mr. Ramos, visiting the forest, and the Golestan National Park, the town of Galikesh, and the villages of Chehelchay, Chamaani, Tarseh, Dozayn, accompanied by Experts from the Province
16.00 (Field Trip) Mr. Mister, Mr. Mukalled, Mr. Oosten, visiting the village of Loveh and meeting the local committee

Friday, 19 October 2001 (27 Mehr 1380)

08.00 Visiting the town of Gonbad, Gorgan, Bandar Torheman, Ashoura-deh, lunch meeting with the Head of the Fishing Industry of Ashoura-deh, visiting to town of Bandar Gaz, the Jafakandeh river in Bandar Gaz, visiting the Gorgan river delta the village of Khajehnafas

Saturday, 20 October 2001 (28 Mehr 1380)

06.00 Visiting the Golestan National Forest, up stream of doogh river, the villages of Dasht, Tangdareh, Beedak, Baghcheh, Kalpoush,
09.00 Meeting with Mr. Hosseinian, Head of the Department of Water Affairs, attended by Mr. Mukalled
16.00 De-briefing meeting with Mr. Dabagh Deputy, Construction Affairs at the Governorship-General of Golestan Province, and Mr. Safavie head of DTF Golestan Province

Sunday, 21 October 2001 (29 Mehr 1380)

09.00 Visiting the Watershed Management Organization, and the GIS system
12.00 Return to Tehran by car

Monday, 22 October 2001 (29 Mehr 1380)

Strategy formulation and report writing

Tuesday, 23 October 2001 (30 Mehr 1380)

11.00 De-briefing meeting with Mr. Francesco M. Bastagli, UNDP Resident Representative and Mr. Haoliang Xu, Deputy Resident Representative at UNDP

14.00 Debriefing meeting with Mr. Seyed Abbas Jazayeri

Wednesday, 24 October 2001 (1 Aban 1380)

11.0 Briefing of UN Disaster Focal Points.

Thursday, 25 October 2001 (2 Aban 1380)

Report Writing

3 ANNEX: PEOPLE CONSULTED

1. Mr. Pajouhesh, Political & Security Deputy of the Governor-General of Golestan Province.
2. Mr. Safavie, Head of the Disaster Force Management, Golestan Province.
3. Mr. Salari, Supervisor of the Technical Division at the Governor-General's office, Golestan Province.
4. Mr. Margdari, Director of Provincial Organization of Agricultural Jihad, Crop & Horticulture, Golestan Province.
5. Mr. Ghafari, Head Watershed Management Organization, Golestan Province.
6. Mr. Hosseinian, Head of the Department of Water Affairs, Golestan Province.
7. Mr. Yakhkeshi, Expert, Department of Water Affairs, Golestan Province.
8. Mr. Keshavarz, Director of the Housing Foundation, Golestan Province.
9. Mr. Akbarpour, Head of the Department of Natural Resources, Forest & Rangeland, Golestan Province.
10. Mr. Vafaian, Expert, Department of Natural Resources, Forest & Rangeland, Golestan Province.
11. Mr. Mehrjoo, Expert, Department of Environment, Golestan Province.
12. Mr. Rezaie, Managing Director of the Department of Water and Sewage, Golestan Province.
13. Dr. Ahmadi, Head of the Red Crescent, Golestan Province.
14. Mr. Mohammadgholipour, Expert, The Meteorological Organization, Golestan Province.
15. Mr. Zafari Expert, Department of Transport & Roads, Golestan Province.
16. Mr. Mohajer, Expert, Department of Transport & Roads, Golestan Province.
17. Mr. Kafash, Expert, Meteorological Organization, Golestan Province.
18. Mr. Bahrami, Expert, the Housing Foundation, Golestan Province.
19. Mr. Khajeh, Technical Deputy, Department of Natural Resources, Forest & Rangeland, Golestan Province.
20. Mr. Mohammadnejad, Expert, Department of Water and Sewage, Golestan Province.
21. Dr. Najafinejad, Professor of Agriculture and Natural Resources, Gorgan University, Golestan Province.
22. Mr. Janbegloo, Managing Director of the Gorgan Ravanab Consulting Engineers, Golestan Province.
23. Mr. Ghaderi, Expert, Disaster Task Force, Golestan Province.
24. Mr. Ahmadi, Expert, Disaster Task Force, Golestan Province.

People met during the Field Trip:

(Some of who are in the list above)

1. Mr. Ahmadi, Expert, Disaster Task Force, Golestan Province.
2. Mr. Yakhkeshi, Expert, Department of Water Affairs, Golestan Province.
3. Mr. Vafaian, Expert, Department of Natural Resources, Forest & Rangeland, Golestan Province.
4. Dr. Najafinejad, Professor of Agriculture & Natural Resources, Gorgan University, Golestan Province.
5. Mr. Baniagheel, Expert, Department of Agricultural Jihad, Golestan Province.
6. Mr. Parsa Mehr, Expert, Watershed Management Organization, Golestan Province.
7. Mr. Ghazalsofloo, Expert, Watershed Management Organization, Golestan Province.

Annex IV Institutional Structure in Golestan

In the national and provincial levels, following governmental organizations have a main roles for Planning, programming and executing of the activities related to the agriculture, animal husbandry, water resources, forests and rangelands, fishery, nature conservation and urban-rural development:

Ministry of Agricultural Jihad:

- Department of Planning and Programming
- Organization of Agricultural Education, Research and Extension
 - Research Institute for Improvement of Seeds and Saplings
 - Forests and Rangelands Research Institute
 - Provincial Research Center for Natural Resources and Animal Husbandry
 - Fisheries Research and Training Institute
 - Livestock Research Institute
 - Veterinary Organization
 - Watershed Management Research Institute
- Department of Livestock Affairs
- Department of Rural Development and Construction
- Provincial organization of Agricultural Jihad
- Agricultural Bank
- Forests and Rangelands Organization (FRO)
 - Provincial Department of Natural Resources (FRO)
- Department of Watershed Management
 - Provincial Centre of Watershed Management
- Iranian Fisheries Company
 - Provincial Department of Fisheries Company

Parliament's Agricultural Commission

Ministry of Energy

- Department of Water Management (Affairs)
 - Provincial Department of Water Management

Department of the Environment (DoE)

- Provincial Department of the Environment (DoE)

Ministry of Road and Transportation (MRT)

- Provincial Department of MRT
- Organization of Meteorology

Ministry of Industries (Food and Agricultural Industries)

- Provincial Department of MI

Ministry of Trade

- Provincial Department of MT

Cereal Organization

Sugar Organization

Organization of Management and Planning

Bureau of Agriculture and Rural Development

Bureau of Landuse Planning

Provincial Department of OMP

Ministry of Oil

Iranian Oil Refinery and Development Company

Ministry of Housing and Urban Development

Housing Bank

ANNEX V HYDROLOGICAL, LAND-USE AND PROTECTED AREA DATA

A. Main characteristics of the rivers basins within Golestan Province

Name of river-basins	Total Area (Km2)	Steep Slopy Areas (ha)	Water discharge (million m3/year)	Erosion rate (tons/ha/Year)	Rangelands (ha)	Forests (ha)
Atrak	8,500	25,000	200	23	650,000	-
Gorgan Roud	110,440	250,500	700	12.5	280,400	286,000
Ghareh Sou	160,000	21,700	100	7	12,000	58,600
Western Ghareh Sou & Gorgan Bay	43,000	4200	60	4.7	6,200	16,000
Neka Roud	118,200	11400		11	81,200	17,000

B. Area of the current landuse patterns in the borders of Golestan Province

Current types of landuse	Area (ha)
Range lands	850,000
Forests	400,000
Dry farm lands	405,000
Irrigated farm lands and orchards	487,000
Range and dry farm lands	42,555
Uncultivated and saline land	38,710
Wed lands and reed land	18,685
Other	10,750

C. Major characteristics of the DoE protected areas in Golestan Province

Name	Total Area (ha)	IUCN Class	Main animal species
Golestan National Park	91895	II	Red deer, Buck, Gazelle, Leopard, Brown Bear, Wild Sheep, Wild Goat, Pheasant, Green Woodpecker.
Jahannama & Chelchely Protected Area	63750	IV	Red deer, Buck, Leopard, Brown Bear, Wild Sheep, Wild Goat.
Loveh Protected Area	3550	IV	Red deer, Buck, Leopard, Brown Bear, Wild Sheep, Wild Goat.
Gomishan Wetland	14000	IV	Dalmation Pelican, White Pelican, Greater Flamingo, Swan, Spoonbill, Pygmy Cormorant, Godwits

Alagol, Almagol & Ajigol International Wetlands	3000	IV	White Pelican, Flamingo, Swan, Cormorant(s)
Shirabad National Monument	1650	I	Iranian Salamander, Bat
Azizabad Hunting Prohibited Area	20000	V	Pheasant, Partridge, Passeriforms Birds
Gorgan roud protected river	12 (Km)	IV	Caspian White Fish (<i>Rutilus frisi kutum Kamensky</i>), Kolmeh Fish, Sturgeons

D. Evaluation of current land potentials for each kind of landuses within the territory of Golestan Province.

Landuse classes	Area (ha)
2 nd class dry farming	1,075,604,407
2 nd class forestry	2,653,020,130
3 rd class forestry	4,326,887,154
2 nd class irrigated farming	1,898,577,000
3 rd class irrigated farming	2,807,335,883
1 st class range management	10,189,676
2 nd class range management	1,270,616,019
3 rd class range management	8,242,775,746
3 rd class area suitable for upgrading to 2 nd class range management	242,323,108
TOTAL AREA	22,527,329,193

E. Current potentials of the land for major type of landuses within the territory of Golestan Province.

Type of landuses	Area (ha)
Dry farming	1,075,604,407
Forestry	6,979,907,284
Irrigated farming	4,705,912,883
Range management	9,765,904,620
Total area	22,527,329,194

ANNEX VI: CONCEPTUAL FRAMEWORK FOR INTEGRATED WATER BASIN PLANNING AND MANAGEMENT

1. Introduction

In the previous chapters of this report the problems and the underlying causes of floods have been described. The table contained in this chapter outlines the relationships between the problems and the underlying causes indicating that flood control in the catchment area involves a wide range of sectors, activities and stakeholders.

2. Structure and processes of the river basin

The river basin system comprises the river channel network together with its land-surface area (the “catchment” or, in the USA, “watershed”). The vast majority of rainfall and snowmelt must pass over the land surface, or drain through soil and bedrock, to reach the river. In so doing, the water will interact to some extent with the land cover (usually vegetation) and with soil and bedrock materials. This can affect the quantity of water reaching the channel and its quality (sediment and dissolved load).

2.2 The river basin use system

Many human activities impact upon the natural environment and affect the quantity and quality of water resources. And aquatic environment Therefore, river basin management considers both the direct uses made of water resources and the human activities taking place within a drainage basin which may affect water resources. Of course, many of these operations may potentially conflict with one another, so that water management is complicated by the need to balance various demands. For instance, flood hazard mitigation and drought management have the following interactions with other areas.

3.1.1.1 Flood hazard mitigation:

Protection of life and property from flooding has long been a major concern to those dwelling in river valleys. Management of excess water is not water “use” in the strictest sense but this is nevertheless an important way in which people seek to manage water resources. Response to the flood hazard takes three main forms:

Adjustment (action on flood-prone land):

- emergency action, including evacuation
- floodproofing of specific properties
- land use regulation
- financial measures

Abatement (action in the catchment)

- afforestation
- agricultural practices to combat runoff
- retention ponds in urban areas

Protection (action along the channel)

- dams to contain flood water
- channel modification to increase flood velocities
- confinement of floods within the channel through levee construction
- diversion schemes

Flood protection measures may lead to undesirable effects at various locations within the river system, including: loss of ecological value and biodiversity in engineered

channels, inundation of land by reservoirs, nutrient and sediment retention within reservoirs, channel erosion below reservoirs.

3.1.1.2 Drought management

Shortage of water is a characteristic of many regions; drought management must integrate all facets of water resource management including water supply, water quality, irrigation and farm drainage, energy generation, fisheries management, recreation and landscape aesthetics. Response to the drought hazard takes three main forms:

Supply augmentation

- existing (e.g. inter-basin transfers)
- new (e.g. desalinisation, reservoirs)
- mixed (e.g. conjunctive groundwater storage schemes)

Demand reduction

- proactive (e.g. economic incentives, land use policies, legal measures)
- reactive (e.g. water-saving devices, legal measures, recycling, metering)
- technological adjustments (agricultural changes, urban adjustments)

Impact minimisation

- anticipatory strategies (e.g. forecasting, conflict management)
- loss absorption, acceptance and sharing (e.g. insurance, compensation, relief aid)
- loss reduction and change (e.g. affect cause, damage recovery, change water uses)

Drought management plans have tended to emphasise a series of interlocking actions revolving around six phases: preparation and planning; forecasting; mitigation; relief; recovery; post-drought measures. Effective management of the drought hazard should involve both local conservation plans and regional management of total water resources on an integrated basis.

3.1.2 Human Intervention in the Catchment System

The impact of land use and land management practices on the catchment runoff system takes many forms, affecting not just volume and timing of runoff but also the sediment and pollution load carried by the river. Deliberate modification of the runoff regime is achieved through regulation of the main channel system, especially in relation to dam construction. Inadvertent modification of catchment hydrology can result in many ways; some of the more important are discussed here.

3.1.2.1.1 *Forestry*

- Tree planting can increase the volume and speed of storm runoff if land drainage is required before planting.
- Mature forests reduce runoff, mainly because of canopy interception losses; there are reductions in both storm runoff volumes and baseflow.
- Runoff increases after harvesting/clear-cutting until vegetation cover is re-established; in regions with high rainfall intensities, there may be high volumes of runoff on less permeable soils, with much associated soil erosion, possibly decreasing dry season baseflow as a result.

3.1.2.1.2 *Urbanisation*

- Increase in speed and volume of runoff as more surface runoff and less infiltration; runoff may be even more rapid where storm drainage systems are installed.

- Decreased groundwater recharge.
- Water quality deterioration from domestic sewage, industrial effluent, power generation (heat), salts and hydrocarbons from roads.
- Ecological damage to river channels as a result of channel engineering and embankment construction.
- Loss of floodplain functions because of urban encroachment, particularly buffer zone processes (e.g. sediment trapping, denitrification) and floodwater storage.

3.1.2.1.3 *Agriculture*

- Irrigation diverts water, much of which is then lost via evaporation, which would otherwise have flowed downstream.
- Drainage and reclamation for farmland leads to the loss of important wetland functions including storage of flood waters, amelioration of water quality, fisheries, forest products, biodiversity and wildlife, recreation and ecotourism.
- Drainage of floodplain land to allow more intensive farming may lead to loss of buffer zone functions and higher nutrient export to surface waters.
- Intensive arable cropping and high densities of livestock can lead to increased nutrient export and high rates of soil erosion.

3.1.2.1.4 *River regulation*

- Direct supply reservoirs reduce downstream runoff volumes and delay flood peaks by storage.
- River regulating reservoirs reduce or increase runoff volumes according to the operating conditions; hydro-electric dams may affect the runoff regime at timescales from diurnal to seasonal.
- Evaporation losses from lakes are significant in warmer climates.
- Silt trapping leads to loss of storage capacity.
- Alteration of downstream nutrient loads and water temperature; clear-water erosion of channels.

3. The need for Integrated River Basin Planning and management

River basins contain important natural environments that are used intensively by people. The scale of human activity has tended to increase over time, so that functional linkages are ever more apparent. Economic activities in downstream areas benefit from upland resources, such as water, aggregates and wood.

In order to guide and control these socio-economic developments existing administrative boundaries and governance structures are no longer sufficient. There is a need to develop new management structures and instruments that can take into account the intimate functional linkage between the various elements of the river basin.

Riverine ecosystems support a variety of socio-economic functions. For example:

- they provide space for human settlement and industrial development;
- they produce living and non-living resources, such as fish, agricultural products, aggregates, water, oil and gas; and
- they absorb unwanted products, such as domestic sewage and industrial waste.

- Most, if not all of these functions are affected by socio-economic development. Uncontrolled developments inland may affect the coast, and *vice versa*, and may ultimately result in loss of vital resources. A few examples include:
- soil erosion and loss of fertile land due to deforestation;
- pollution of surface and groundwater due to agriculture and industrial activities;
- loss of productive land due to coastal erosion and dam construction; and
- degradation of coastal wetlands due to changes in hydrological conditions upstream.

Integrated **R**iver **B**asin **P**lanning and **M**anagement (IRBPM) provides the key to the sustainable development of natural, economic and cultural environments within river basins.

In order to guide and control this wide variety of physical, biological and ecological processes, current management objectives are no longer sufficient. There is a need to develop a new environmental management approach that takes into account the intimate functional linkage between the elements in the river basin.

Changing land-use patterns and resource use in upstream areas will affect downstream areas. Changes in land use in the catchment area, such as urbanisation and deforestation, will change runoff and sediment supply, ultimately affecting the downstream and coastal area, and often result in erosion and coastline retreat. Similar effects are produced by hydro-power plants and river regulation: even if the average annual discharge is not changed, reduction in flood peaks and flow regulation will affect sediment transport which often results in erosion of downstream river sections and coastal areas.

4. Approach of Integrated River Basin Planning and Management (IRBPM)

Integrated River Basin Planning and Management (IRBPM) requires the adoption of goals, objectives and policies and the establishment of governance mechanisms which recognise the interrelationships between the various elements in the river basin system with a view to environmental protection and socio-economic development.

The *goals* of integrated river basin planning and management fall within the framework of sustainable development according to which environmental conservation is of equal importance to economic efficiency and social equity, all sought in a long-term perspective on the basis of intergenerational equity.

The basic *principles* of integrated river basin management in the context of sustainable development are to:

- Respect the integrity of the river basin ecosystem and accept limits on the use of resources
- Ensure the strategic importance of renewable resources for socio-economic development;
- Allow for the multiple use of resources integrating complementary activities and regulating conflicting ones;
- Ensure multi-sectoral and multi-level integration in decision making linking broad scale management to local level intervention; and
- Allow for participation of all actors particularly local population in the planning process to assure effective management.

In establishing an integrated management system for river basins it is necessary to adopt a pro-active approach. In this context planning acquires a special role in establishing a process of governance and a strategic framework of goals, policies and actions.

Strategy formulation within the context of IRBPM depends on broader regional and national conditions. The formulation of a strategy often needs to address issues which have an impact on the management of the river basin but which fall outside of the authority of the people participating in the process.

Because of its complex nature, IRBPM requires a high level of integration and coordination within and between institutional structures. A high level of horizontal co-operation is required particularly among sectoral institutions at the planning stage and a high level of vertical linkage is necessary within institutions at the implementation stage.

As issues often transcend administrative boundaries, IRBPM must function at different levels: national, sub-national, and local.

- At the national level policy issues related both to formulation and implementation of IRBPM must be defined. A strategy needs to be elaborated providing the necessary guidelines for local and regional initiatives. An agency which can be responsible for river basin management at a national level must be identified since environmental and conservation standards will be set at this level. A committee which will work on the sectoral concerns, allowing the participation of all interested ministries, may be formed as well.
- At the sub-national level more detailed plans may be developed on the basis of the national guidelines for IRBPM. Co-ordination of local plans for integrated river basin management will be pursued together with the resolution of conflicts with national goals.
- Detailed plans are developed at the local level.

There are two prerequisites for implementation of the plans formulated on the basis of the strategy:

- The plans need to have a legal status that will assure successful implementation.
- The plan must be realistic. This means sensible policies and actions which are commensurate with the scale of the problem, the capability of local government, the human and financial resources required, and the necessary technology support.

A variety of tools and methods can be employed in Integrated River Basin Management at the stages of information management, plan development and implementation. These include: data-bases, Geographic Information Systems (GIS), Decision Support Systems (DSS), Environmental Impact Assessment (EIA), Strategic Environmental Assessment (SEA), economic evaluation of costs and benefits, environment-development scenarios, Carrying Capacity Analysis (CCA), regulation and control or financial mechanisms, awareness, capacity building and education, and conflict resolution.

5. Goals and Objectives of IRBPM

IRBPM provides the context to consider explicitly aspects of natural and socio-economic systems that have previously been seen as outside the scope of interest of policy makers and planners, concerned only with the sectoral development of river basins. For example, there is direct linkage between soil erosion control in headwater

basins and reduced sedimentation down-streams. Recognition of this calls for a better co-ordination of policy making and cross-sectoral actions (water, forestry, agriculture, urban development, environmental protection, etc.), ultimately leading to a more rational use of resources and more effective environmental protection.

The goals of river basin management fall within the scope of sustainable development where economic efficiency and social equity goals are linked to environmental conservation goals. In this context the goal of integrated river basin planning and management is the promotion of sustainable development including the maintenance of all essential ecological processes, life-support systems and biological diversity, while providing local communities with a basic healthy quality of life and reducing their vulnerability to hazards.

In order to realise these objectives, IRBPM will focus on efficient use of space and resources, effective reduction of waste emissions, and preservation of valuable ecosystems. To that end, IRBPM will apply modern management techniques to ensure multi-sectoral and multi-level integration and will foster participation of all stakeholders involved in the decision-making process.

The *general objectives* of IRBPM stem from the need to express such goals in terms of long-range considerations and medium- or short-range needs, allocating resources to various users and maintaining at the same time the proper function of natural ecosystems. In particular IRBPM seeks to:

- develop human resources and strengthen institutional capacities;
- ensure participation of all different stakeholders from both the private and the public sector, in both the upstream and downstream areas;
- protect traditional uses, when proving to be beneficial for both local socio-economic development and environmental protection, and rights and equitable access to coastal resources;
- encourage complementary rather than competitive activities;
- identify where resources can be harnessed without causing degradation or depletion;
- renew or rehabilitate damaged resources for traditional or new uses;
- guide the level of use or intervention so as not to exceed the carrying capacity of the resource base;
- ensure the integrity of river basin ecosystems;
- ensure that the rate of loss of renewable resources does not exceed the rate of replenishment;
- ensure that benefits from the exploitation of non-renewable resources are used for sustainable development;
- reduce risks to vulnerable resources; and
- respect natural processes, encouraging beneficial ones and preventing adverse interferences.

Furthermore, the translation of broader goals (i.e., economic efficiency, social equity and environmental conservation) into objectives must not be done in a linear, independent way. Instead economic issues need to be integrated with social and environmental ones. The definition of objectives must take into account the particular circumstances, both environmental and socio-economic issues of each case. The objectives need also to be linked to the particular *spatial/geographical* context of the area. The objective and corresponding strategies should reflect the nature of the complex issues encountered in the river basin areas, which are multidimensional, multiobjective and multispatial.

6. Policy Priorities

Defining priorities for integrated river basin management is essential in spite of an apparent shift from integration and a holistic, long-term point of view. Often, the identification of priorities may be influenced by “fashion, the availability of data, the offer of external funding, sectoral needs, or political imperatives”. In the context of rational management, priorities should be set on the basis of objectives and available resources only then taking advantage of local resident, official and political support, in the hope that successful intervention will create opportunities for more generalised action.

7. Strategies

Integrated River Basin Planning and Management (IRBPM) draws from natural resource management, environmental management and land-use planning:

- *Natural resource management* focuses on the identification and valuation of key natural resources, putting in place rules and priorities for their development with a view to sustainable development.
- *Environmental management* deals with a range of environmental quality issues, from species to ecosystem management.
- *Land-use planning* concentrates on the allocation of uses to resources and spatial areas with a view to anticipating future developments. It is also concerned with infrastructure development.

Annex VII Proposal for Rehabilitation Activities in the Doogh River Basin, Golestan, Iran

1 BACKGROUND

On Friday, 10 August 2001, torrential rains triggered flash floods in the Gorgan and Doogh Rivers in Golestan, Iran. Areas of Khorasan and Semnan provinces were also affected. The flash floods in Golestan were the worst in 200 or more years, killing 247 people and leaving over 10,000 people homeless. In addition the floods destroyed some 15,000 ha of farmland and 10,000 ha of forest and rangeland. Financial losses for the province were estimated at 491 billion Rials, or US\$61.6 million.

The Government responded immediately with the provision of relief items that included food, cloth, blanket, tent and medicine. It also relocated 10,000 of the affected population to safe areas. Water, electricity, gas and telephone services were restored in most of the affected areas and roads were repaired on an emergency basis. The Government allocated 110 billion rials, or US\$13.75 million, for rehabilitation and has been providing loans and grants to families that have lost their homes and affected farmers who have no insurance coverage.

Following the floods the Emergency Response Division of UNDP, in consultation with the Tehran Country Office, agreed on the need to support the Government in the preparation of an integrated and comprehensive recovery and rehabilitation plan. UNDP was joined by UNEP and FAO in fielding a seven person inter-agency mission to Iran between 14 and 26 October. The objective of the mission was to assist the Government of the Islamic Republic of Iran to formulate a strategy and framework for post flood recovery and rehabilitation in the flood affected areas of Golestan. This proposal for Rehabilitation Activities in the Doogh River Basin has been developed out of the mission's report.

The mission found that the short-term rehabilitation needs of the flood-affected areas have been largely successfully assessed and rehabilitation measures undertaken by government agencies. By visiting the affected area and talking to communities and authorities, the mission identified some gaps in the rehabilitation process and saw a need for assistance from UN agencies.

The mission also undertook an analysis of the flood problem and its causes and proposed an integrated water basin planning and management programme as the solution to the management of long-term flood prevention in Golestan Province. This would be achieved through a process in which all relevant sectors and stakeholders, and particularly the affected communities, will be involved and participate.

Further information on the flood damage and the recommended integrated river basin management and planning approach is contained in the Mission Report available with this proposal.

2 OBJECTIVES

The overall objective of this project is the rehabilitation of community facilities affected by floods in the Doogh River Basin, Golestan and the reduction of vulnerability to future floods by:

- ensuring that those who remain seriously affected, particularly in terms of housing and services, receive prompt assistance, and
- developing and implementing a pilot ecosystem approach to vulnerability reduction.

3 STRATEGY AND ACTIVITIES

There is an urgent need for a number of recovery and rehabilitation measures in advance of the oncoming winter season to meet immediate needs and to mitigate against future floods. UNDP will work with the Golestan Disaster Task Force (DTF) and the Forestry and Rangelands Organisation (FRO) in Golestan to address the reconstruction of community owned infrastructure and facilities and to undertake a pilot activity addressing land degradation.

A national Project Manager will be appointed by UNDP to work with the DTF and FRO on the following activities:

- Undertaking a survey of affected villages to identify community owned infrastructure and facilities that remain damaged by the flood and to implement rehabilitation and repair on a priority basis.
- Ensuring that villagers with damaged or destroyed housing and who are living in tents gain access to available loans and grants and are supported in the reconstruction of their homes.
- Promoting and assisting the Golestan government in the development of an integrated river basin plan for the Gorgan Basin utilising appropriate consultants where necessary.
- Developing and implementing pilot activities to address land degradation through community participation.
- Encouraging and providing support to community flood reduction activities.

The project is anticipated to last for one year after which time the more detailed and long-term programme will have commenced implementation.

4 BUDGET

National Project Manager	US\$18,000
International and/or local consultants	US\$8,000
International travel	US\$7,000
Local travel	US\$1,000
Rehabilitation activities	US\$120,000
Support to planning process	US\$10,000
Land degradation materials and supplies	US\$200,000
Small grants for community flood reduction	US\$36,000
Total	US\$400,000