MINISTRY OF JIHAD-E-AGRICULTURE
THE ISLAMIC REPUBLIC OF IRAN

No.

THE STUDY
ON
FLOOD AND DEBRIS FLOW IN THE CASPIAN COASTAL AREA FOCUSING ON THE FLOOD-HIT REGION IN GOLESTAN PROVINCE
IN
THE ISLAMIC REPUBLIC OF IRAN

FINAL REPORT

VOLUME I
MAIN REPORT

OCTOBER 2006

Japan International Cooperation Agency

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Composition of Final Report

Volume I	**Main Report**
Volume II	**Summary**
Volume III-1	**Support Report 1: Master Plan**
Volume III-2	**Support Report 2: Feasibility Study**
Volume IV	**Data Book**

PROJECT COST ESTIMATE

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PREFACE

In response to a request from the Government of the Islamic Republic of Iran, the Government of Japan decided to conduct the Study on Flood and Debris Flow in the Caspian Coastal Area Focusing on the Flood-Hit Region in Golestan Province in the Islamic Republic of Iran and entrusted the Study to the Japan International Cooperation Agency (JICA).

JICA selected a study team composed of staff member of CTI Engineering International Co., Ltd. The team was headed by Mr. Kanehiro MORISHITA and was dispatched to Iran four times between October 2004 and July 2006. In addition, JICA set up an advisory committee headed by Mr. Yoshifumi HARA, Director of Erosion Control Division, Public Engineering Work Department, Nagano Prefecture, for the same period, which examined the Study from specialist and technical points of view.

The team held discussions with the officials concerned of the Government of the Islamic Republic of Iran and conducted field surveys and studies in the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the promotion of this project and also to the enhancement of friendly relations between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of the Islamic Republic of Iran for their close cooperation extended to the Study.

October 2006

Ariyuki MATSUMOTO

Vice-President

Japan International Cooperation Agency

October 2006

Mr. Ariyuki MATSUMOTO
Vice-President
Japan International Cooperation Agency

Letter of Transmittal

Dear Sir,

It is with great pleasure that we submit herewith the Final Report of the "Study on Flood and Debris Flow in the Caspian Coastal Area Focusing on the Flood-Hit Region in Golestan Province".

The main objectives of the Study were fourfold: (i) to formulate a master plan up to the target year 2025 for prevention of flood and debris flow disaster in the Madarsoo River basin, in which serious flood damages occurred in 2001; (ii) to select priority projects among the measures/schemes proposed in the above master plan and to carry out the feasibility study on them; (iii) to prepare technical manual and guidelines, containing planning and designing of flood and debris flow countermeasures, applicable not only to the Madarsoo basin but also to similar other basins in the Caspian coastal area; and (iv) to pursue technology transfer to counterpart personnel in the course of the Study, mainly focusing on planning and designing processes on flood and debris flow disaster mitigation and management.

Phase I of the Study examined the present conditions of the basin as the basic study, and a master plan was formulated in accordance with the above-mentioned objectives in Phase II. Subsequently in Phase III, the feasibility study was made for the selected priority projects among the master plan components. The Final Report presents the outcomes from these three phases' studies.

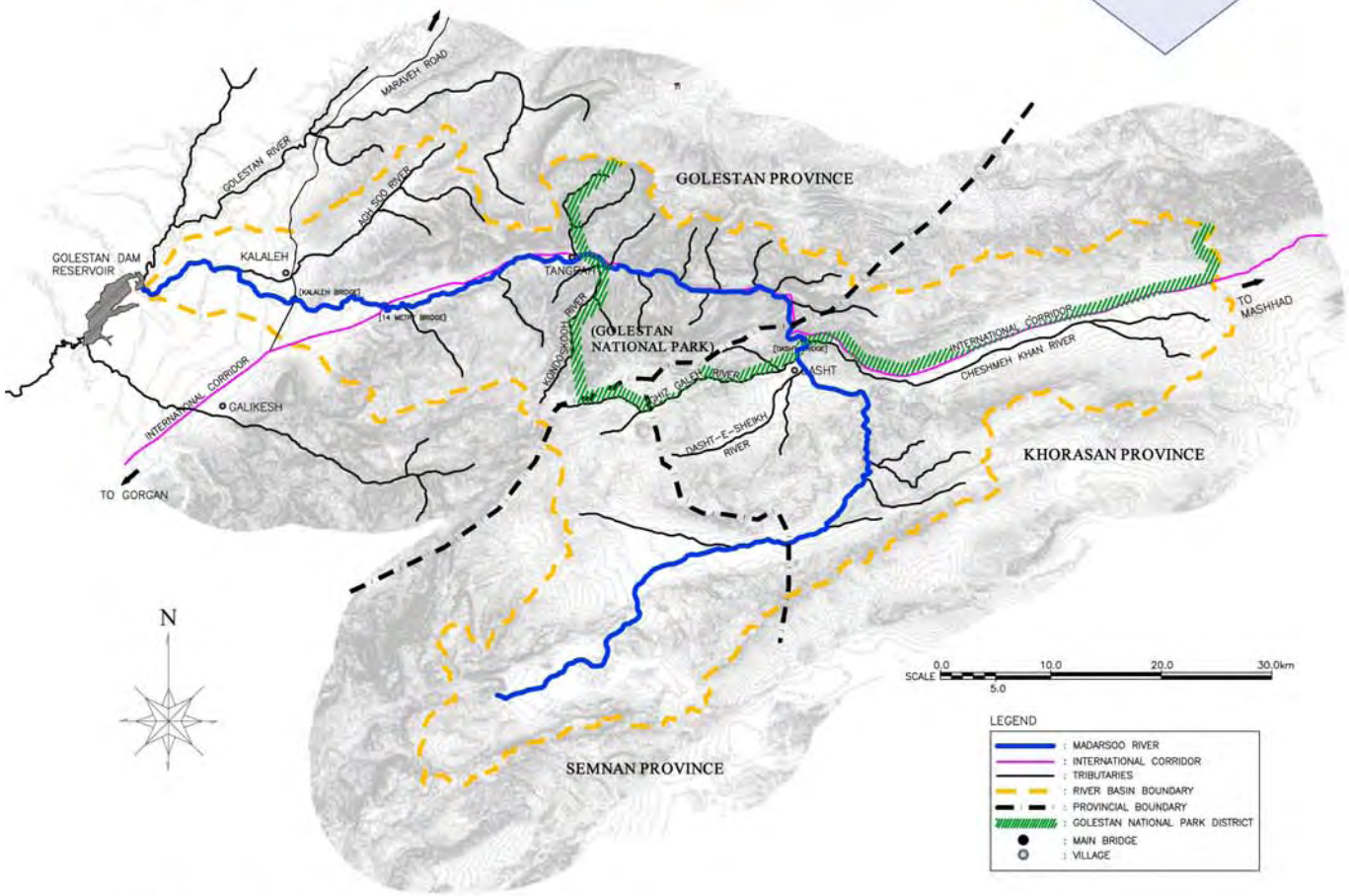
We hope this Final Report will assist strengthening disaster management activities against flood and debris flow not only for Golestan province but also for the Caspian coastal area. We believe that implementation integrating structural and non-structural measures proposed in the Report would assure further improvements in disaster management capacities of the relevant communities as well as the local governments in the long term and thus would contribute to uplifting the social welfare and living environment of people in the area.

We wish to express our sincere gratitude to the personnel concerned of your Agency and advisory committee for the guidance and support given throughout the Study period. Our deep gratitude is also expressed to the Watershed Management Deputy of the Ministry of Jihad-e-Agriculture (acted as Counterpart Agency) and other concerned authorities of the Government of the Islamic Republic of Iran, JICA Iran Office, and the Embassy of Japan in Iran for their close cooperation and assistance extended during the course of the Study.

Very truly yours,

Kanehiro MORISHITA
Team Leader
The Study on Flood and Debris Flow in the Caspian Coastal Area Focusing on the Flood-Hit Region in Golestan Province in the Islamic Republic of Iran

The Islamic Republic of Iran



The Madarsoo River Basin

General Map for the Study Area

MASTER PLAN FORMULATION

1 MASTER PLAN CONCEPT

The master plan for flood and debris flow mitigation and management shall cover the entire fields and processes of flood disaster occurrence and response, and shall integrate the efforts being made by the relevant organizations. Thus the master plan shall be comprehensive including entire process of disaster management: preparedness, urgent response, recovery and development, and prevention and mitigation.

The Goals are “to create the river basin well-managed against flood and debris flow disaster so as to enhance the people’s living standards”.

It implies that only minimal and tolerable damages cloud be admitted in the basin during the design flood. In order to realize such goals, the following two objectives shall be pursued at least:

(1) To save people’s lives, and

(2) To secure social, environmental and economic functions of natural and social assets.

Following the goals and objectives, the master plan shall cover the wide fields in space and time and integrate the protective, remedial and improving measures against flood and debris flow.

The target year of the master plan shall be set in the year 2025. Furthermore 25-year flood for protecting farmlands and rural villages and 100-year flood for protecting important structures (trunk road and bridges) and town areas are adopted as hydrological design scales in the master plan.

2 MASTERPLAN COMPONENT

After selection of suitable and effective countermeasures, the selected countermeasures, which could be arranged to cope with flood and debris flow in space and time, shall be combined for the master plan components as supporting sub-schemes. These countermeasures could be organized into master plan components considering area by area, from upper to lower reaches, for easy understanding.

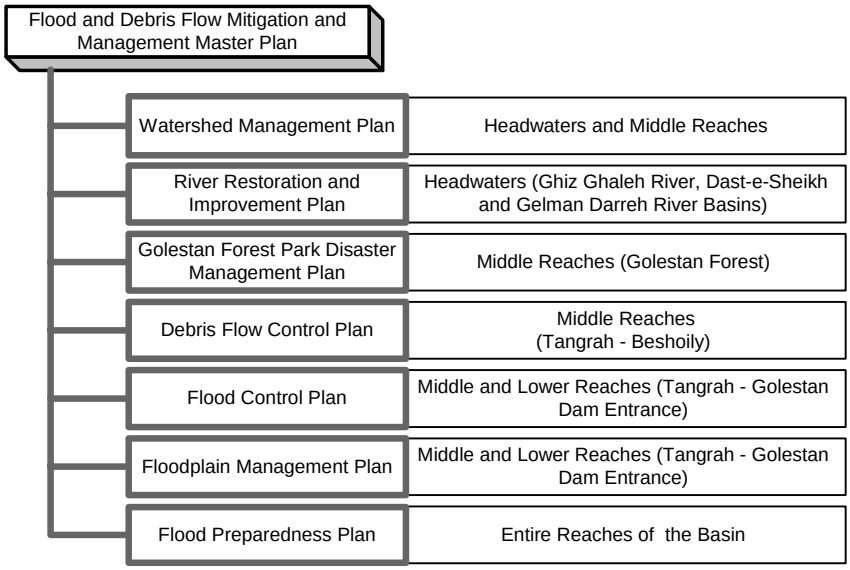


Fig. 1 Master Plan Components for Flood and Debris Flow Mitigation and Management

3 PROJECT COST AND EVALUATION

Table 1 summarizes the proposed master plan components and their costs. The master plan integrates newly proposed plans and on-going projects since they are closely related each other. Watershed management plan, including debris flow control plan, is being conducted by MOJA, and flood control plan is also being conducted as a rehabilitation part by MOE and MORT.

Table 1 Summary of the Proposed Master Plan Component and Sub-Scheme

Master Plan Component		Sub-Scheme	Component/Scheme Digest	Project Cost (million Rials)
1	Watershed Management Plan	5 sub-basins	Conducting improvement measures combining mechanical, bio-mechanical and biological engineering measures	79,374
2	River Restoration and Improvement Plan	Ghiz Ghaleh	Rehabilitating the damaged earth dam to consolidate stored sediment and constructing channel system in Ghiz Ghaleh	55,890
		Gelman Darreh and Dasht-e-Sheikh	Constructing channel system in the Gelman Darreh and Dasht-e-Sheikh	195,200
3	Golestan Forest Disaster Management Plan	Flood forecasting and warning system	Improving existing meteo-hydrologic monitoring system, data transmission and processing system to utilize real time data for flood forecasting, and installing warning posts	3,300
4	Debris Flow Control Plan	(Assistance for MOJA activities)	Constructing sediment control structures and channeling works in debris flow affected villages	-
5	Flood Control Plan	(Recommendation to MOE and MORT plans)	Rehabilitating damaged structures in both of the 2001 and 2005 floods and establishing the master plan for the Golestan dam basin	-
6	Floodplain Management Plan	Publication of flood hazard map	Publishing the flood and debris flow hazard map and utilizing it for evacuation activities and land use management	-
7	Flood Preparedness Plan	Extension of flood warning system	Installing warning posts at villages located in the middle and lower reaches to announce the flood warning to the villagers	3,300
		Educational assistance	Conducting education and awareness of flood hazard and training exercise for strengthening community-based disaster management	-

Regarding project evaluation, quantitative economic evaluation was made in two components as tabulated below. Both projects could be regarded as viable ones from the estimated EIRR and project nature of disaster management.

Table 2 Estimated EIRR in the Proposed Master Plan Components

	Under Present Condition	Under Year 2025 Condition
River Restoration and Improvement Plan	8.86 %	9.38 %
Golestan Forest Disaster Management Plan	10.47 %	15.06 %

As for environmental and social evaluation, all of the proposed projects are also considered acceptable and preferable to the localities.

FEASIBILITY STUDY

1 PRIORITY PROJECTS

From importance of project location, significance of project effects in a short period, high economic efficiency, and suitable themes for technology transfer, the following three projects were selected as priority projects.

- River restoration plan: rehabilitation of sediment control dam and riverbank stabilization works against valley-head erosion,
- Golestan Forest Park disaster management plan: establishment of flood forecasting and early warning system, and
- Flood preparedness plan: hazard map preparation and community-based disaster management.

2. PROJECT FEATURES

(1) River Restoration Plan

Proposed river restoration plan is composed of two components, namely sediment control dam and river stabilization works.

Sediment control dam is planned to rehabilitate the earth dam breached in the 2001 Flood, to consolidate the stored sediment in the basin of the earth dam, and to stabilize the lower part of the Ghyz Ghaleh River channel. Through comparative study among dam type and location of floodway, earth dam type with floodway on the left bank was selected as an optimum plan. The construction cost was estimated at 12,060 million Rials (equivalent to 1.34 million USD). Its plan is presented below.

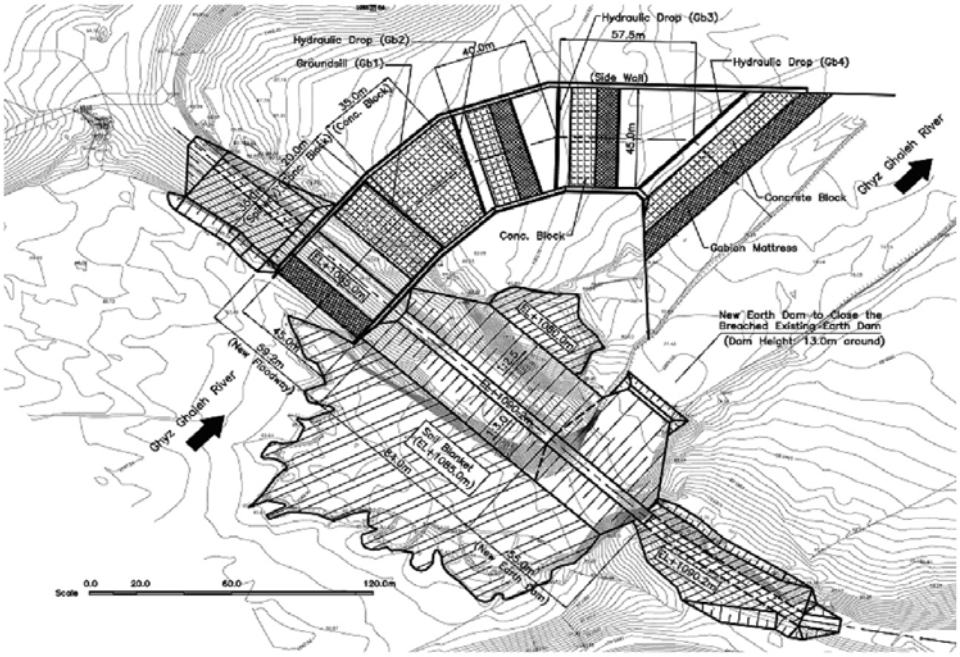


Fig. 2 Plan of Proposed Sediment Control Dam Works

Meanwhile, river stabilization works is planned to consolidate the valley-head erosion downstream of Dasht village, to stabilize both lower and upper channels of the proposed structure, and to protect the farmland from progressive gulley erosion. Through comparative study among concrete dam type and hydraulic drop structure type, concrete dam and

hydraulic drop of a compromised type was selected as an optimum plan. The construction cost was estimated at 11,890 million Rials (equivalent to 1.32 million USD). Its plan is presented in Fig. 3.

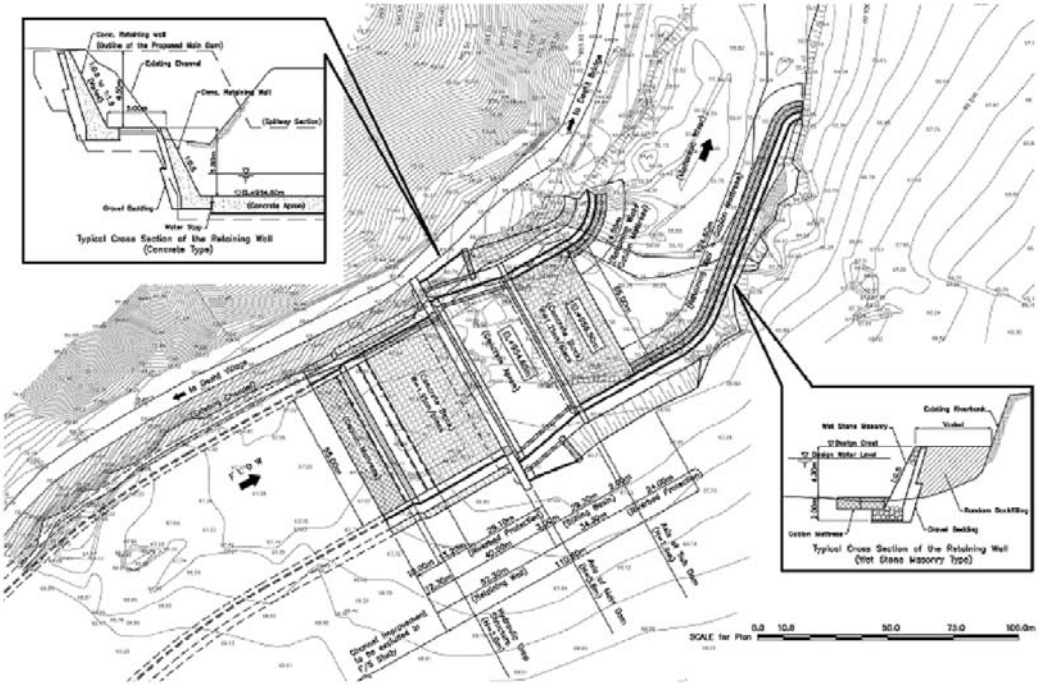


Fig. 3 Plan of Proposed Riverbank Stabilization Works

Implementation of construction in both works is planned for about two and half years. From the economic viewpoints, the EIRR shows 18.7 % under the present conditions and 19.2 % under the future (year 2025) conditions. These figures mean the projects have high economic viability.

From the environmental and social viewpoints, the identified negative impacts are temporary, mostly limited to appear during construction phase, and reversible. Thus these projects are recognized as controllable and socially acceptable.

(2) Golestan Forest Disaster Management Plan

In the past two floods, 2001 and 2002, casualties concentrated in the Golestan Forest Park, and most of them were visitors and tourists. In order to save their lives from disastrous floods, early and reliable flood forecasting and warning system is indispensable.

The study aim was how to improve the present situation of meteo-hydrological observation network and forecasting and warning system. The alternatives were derived from the three conceptual improvement; namely, (1) manual system, (2) semi-automatic system, and (3) full-scale automatic system. The best combination of data collection, processing and warning sub-systems was sought among the above improvement steps through the comparative study. Finally optimum combination was selected as semi-automatic data collection, full-scale automatic data processing, and manual warning system.

The installation cost was estimated at 4,282 million Rials (equivalent to 476 thousand USD), and system installation work required about 2 years. From the economic viewpoints, the EIRR shows 7.2 % under the present conditions and 13.7 % under the future (year 2025) conditions. These figures mean the project has high economic viability. From the environmental and social viewpoints, the project is recognized as environmentally sound and socially acceptable since construction works are limited in a few spots and minimal.

Proposed flood information flow is presented in Fig. 4.

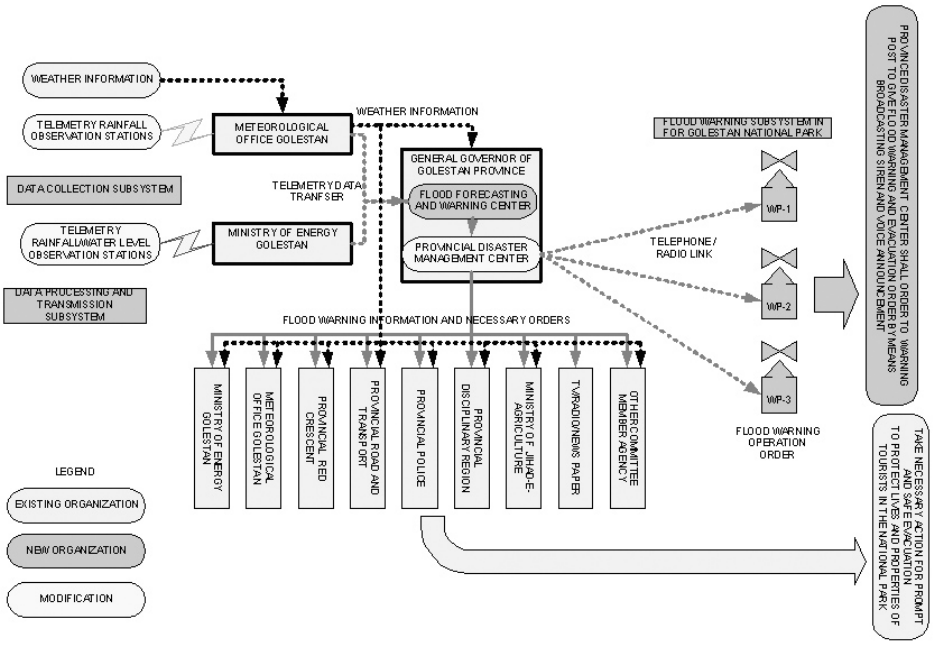


Fig. 4 Proposed Flood Information Flow

(3) Flood Preparedness Plan

Flood preparedness is a generic term including activities on knowledge building, training on evacuation and rescue assuming disaster situations, improvement of disaster management units at community level. In the course of the feasibility study, the study team prepared hazard map and issued newsletter containing hazard map and evacuation route. On the other hand the team conducted a series of workshops in Terjenly and Dasht villages selected for pilot activities.

Good combination with structural and non-structural measures could realize safer situation in the river basin from flood disasters. The first project, river restoration, is purely one of the structural measures. The second one, Golestan Forest disaster management, is likely in between both measures. The third one, flood preparedness, is purely one of the non-structural measures. Thus such holistic approach in good combination between top-down measures (structural measures) and bottom-up measures (non-structural or community-based measures) could produce the most effective management frame against flood disaster.

RECOMMENDATIONS

Throughout the study, the following recommendations could be pointed out for further progress of disaster mitigation and management against flood and debris flow in the Madarsoo River basin.

(1) Early Implementation of River Restoration Plan

The study results are limited to the preliminary design level and it shall be conducted to further elaborate the implementation plan with the additional detailed survey, geological investigation, planning and design for the proposed structures in order to prepare the necessary documents such as detail design drawings, more precise construction quantity estimate, tender document preparation including technical specifications, etc.

According to the geological field reconnaissance, the riverbed in the Madarsoo River and the Ghyz Ghaleh River are thick covered with coarse sand, which is relatively good quality for concrete materials originated from the ancient sediment deposit in the Cambrian or Jurassic

Periods. It is recommended to conduct the detail applicable study including the design of mix proportion for the site-generated soil utilization as the concrete material on the detail design stage.

If the coarse sand of the site-generated soil could be applied to the aggregate material of the appropriate concrete, the surplus soil generated by the excavation is utilized as the useful construction materials and it is expected to reduce the construction cost of the hauling and removal of surplus soil expenses. Furthermore this research activity can provide technical guidelines of soil cement application suitable for Iranian gravels and soils, and the structures to be constructed will be a model case of sediment and erosion control structures.

(2) Early Establishment of Flood Forecasting and Warning System and FFWC

As experienced in the 2005 Flood, early flood warning was revealed to be effective for saving human lives of visitors and campers in the Golestan Forest Park. The study indicates necessary and appropriate improvement approach in the existing meteo-hydrological monitoring and flood warning system. The study proposed that Flood Forecasting and Warning Center (FFWC) should be established in Provincial Disaster Management Center (PDMC), in accordance with the discussion made in the technical committee meeting in March 2006.

It is strongly recommended that FFWC shall be established as early as possible. Substantially FFWC has responsible for flood disaster issues in the entire Golestan province. In parallel with establishment of FFWC, improvement of the flood foresting and warning system shall be also conducted. This system will be a model case in Iran, and applicable to the similar basins in the Caspian coastal area.

(3) Further Careful Investigation for Gelman Darreh Reservoir Scheme

After the riverbank stabilization works completion to be proposed, it is desirable to execute the channel improvement as soon as possible to reduce the flood damage occurrence in and around the Dasht village. Furthermore MOE-North Khorasan is planning the flood control dam located at the entrance of Dasht basin in the Gelman Darreh River. Such large-scale reservoir is one of the alternatives to the said river improvement. However the large-scale structure will produce significant adverse effects to the natural and social environment. Thus it is recommended that MOE-North Khorasan shall conduct careful and technical-sound investigation for the dam planning.

(4) Necessity of Field Research and Investigation Activities

MOJA has conducted various types of countermeasures in watershed management for a long time. From planning side, however, the effects of watershed management measures are not clear yet in hydrology and meteorology. Quantitative relationship between the measures and physical effects shall be clarified for future expansion of these measures. Therefore basic research activities, which set up some experimental fields and continue to observe the meteo-hydrological parameters, are indispensable for establishment of reasonable relationship between countermeasures and their meteo-hydrological effects.

In addition, rainfall intensity curves shall be revised or newly established for hydrological designing of watershed management structures, such as sediment control dams and channel works, in accordance with accumulation of short-duration rainfall records. This work is a time taking effort to store and analyze the short-duration rainfall data over the basin/province. The short-duration rainfall monitoring has just started after the 2001 Flood in the Madarsoo River basin.

(5) Necessity of Monitoring Activities on Sediment Transport

The Ghyz Ghaleh River is one of the large sediment yielding sub-basins in the Madarsoo basin so that the study team gives the first priority on the rehabilitation of the earth dam

breached in the 2001 Flood. Sediment runoff is estimated at 200 to 400 thousand m^3 at the said dam-site during the 25-year design flood. Sediment runoff computation, however, usually contains the much uncertainties. Thus monitoring activities in the field is indispensable after completion of the rehabilitation in order to properly manage the excessive sediment runoff.

These monitoring activities consist of regular inspection for sediment accumulation in the downstream reaches as well as in the sedimentation basin of the dam, and seasonal inspection for conditions of mechanical and biological measures to be implemented in the watershed. Based on the monitoring results, MOJA can determine necessity of additional upstream sediment control dams. Therefore this kind of step-by-step approach is suitable and monitoring is essential particularly for the area having much sediment runoff without enough scientific/engineering information.

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MAIN REPORT I (MASTER PLAN)

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ABBREVIATIONS

Organization

DOE	Department of Environment
FFWC	Flood Forecasting and Warning Center
FRW	Forest, Rangeland and Watershed Organization
IUCN	International Union for Conservation of Nature
JICA	Japan International Cooperation Agency
MET	Meteorological Organization
MOJA	Ministry of Jihad-e-Agriculture
MOE	Ministry of Energy
MOHUD	Ministry of Housing and Urban Development
MOI	Ministry of Interior
MORT	Ministry of Roads and Transportations
MPO	Management and Planning Organization
NRGO	Natural Resource General Office
PDMC	Provincial Disaster Management Committee
RCS	Red Crescent Society
UNESCO	United Nations Educational, Scientific and Cultural Organization
WMO	World Meteorological Organization

Technical Terms

ADSL	Asymmetric Digital Subscriber Line
B/C	Benefit - Cost Ratio
BCD	Binary Coded Decimal
CPT	Cone Penetration Test
CSG	Cemented Sand and Gravel
DEM	Digital Elevation Model
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EL	Elevation
FFWS	Flood Forecasting and Warning System
F/S	Feasibility Study
GIS	Geographic Information System
GSM	Global System for Mobile Communication
IEE	Initial Environmental Examination
ISDN	Integrated Service Digital Network
MODEM	Modular-Demodular
NPV	Net Present Value
OCC	Opportunity Cost of Capital
ODA	Official Development Assistance
O/M	Operation and Maintenance

PRA	Participatory Rural Appraisal
PSTN	Public Switched Telephone Networks
RCRI	Radio Communication Regulatory of Iran
SPT	Standard Penetration Test
S/W	Scope of Work
TIN	Triangulated Irregular Network
VAT	Value Added Tax
VES	Vertical Electric Sounding
VHF	Very High Frequency
WLL	Wireless Local Loop

ABBREVIATIONS (MEASUREMENT UNIT)

Length		**Velocity**	
mm	millimeter	m/s	meter per second
cm	centimeter	**Sound Volume**	
m	meter	dB	decibel
km	kilometer	**Electric Power**	
Area		V	volt
m^2	square meter	**Time**	
km^2	square kilometer	sec	second
ha	hectare	min	minute
Volume		hr	hour
m^3	cubic meter	yr	year
l, L	liter	**Currency**	
MCM	million cubic meter	IRR	Iranian Rial
Flow Rate		JPY	Japanese Yen
m^3/s, CMS	cubic meter per second	USD	United States Dollar
Weight		**Others**	
mg	milligram	%	percent
g	gram	℃	degree centigrade
kg	kilogram	10^3	thousand
ton	metric ton	10^6	million
		10^9	billion

CHAPTER 1 INTRODUCTION

1.1 Background of the Study

The Caspian region, a northern part of the Islamic Republic of Iran including provinces of Gillan, Mazandaran and Golestan, has been frequently affected by the disasters of flood and debris flow. In the Madarsoo River basin, which is one of the disaster-affected areas in this region, about 260 people and 60 people were killed due to disasters of flood and debris flow during summer time in 2001 and 2002, respectively. Furthermore, thousands of livestock were lost and a lot of infrastructures, such as bridges and roads, were washed out or destroyed.

The Madarsoo River basin is located in the Golestan, North Khorasan and Semnan Provinces. It originates in the north side (the Caspian Sea side) of the Alborz Mountains running from the east to the west through the northern part of the country, and joins the Gorgan River that finally empties into the Caspian Sea. The Madarsoo River has a catchment area of 2,360 km^2 and a length of about 100 km. The population in the basin is about 60,000 people and the average annual rainfall is about 400-500 mm in this area. The road running paralleled to the river course is a part of important international corridor linked to neighboring countries, Turkmenistan and Afghanistan, and the sacred place of Shiite Muslim, Mashhad. The peak traffic density of the road is about 25,000 units/day.

In addition to the Madarsoo River basin, there are some river basins being composed of similar situations in hazardous topography and climate in the region. For instance about 50 people were killed by the disasters of flood and debris flow in the Nekka River basin in the Mazandaran Province, and the Maslee River basin in the Gillan Province is also under similar situation to these basins.

Under such vulnerable situations suffering from flood and debris hazards in the Caspian region, effective countermeasures have not been carried out yet. Furthermore the Government of the Islamic Republic of Iran (hereinafter referred to as "the Government of Iran") has not formulated the master plan for disaster mitigation and management to rationalize and integrate various components of the structural and non-structural measures/schemes. Therefore formulation of the master plan in the Madarsoo river basin and transfer of technologies, which are based on the study/research experiences and technical standards for the similar basins, are urgently required in the Caspian region.

In response to the official request of the Government of Iran, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the preparatory study team, headed by Mr. Hara Yoshifumi, to Iran in the end of August 2003. After continuous discussion between the team and the Government of Iran, the both parties finally agreed upon the Scope of Work (hereinafter referred to as "S/W") and the Minutes of Meetings for the better understandings of the S/W on 3rd September 2003.

Based on the S/W and the Minutes of Meetings, JICA decided to commence the captioned development study on "Flood and Debris Flow in the Caspian Coastal Area focusing on the Flood-hit Region in the Golestan Province in the Islamic Republic of Iran", and to dispatch the study team to Iran in the end of October 2004.

1.2 Objectives of the Study

Objectives of the study are as follows:

1) To formulate a master plan up to the target year 2025 for prevention of flood and debris flow disaster in the Madarsoo River basin,

2) To select priority projects among the measures/schemes proposed in the above-mentioned master plan and to carry out the feasibility study on them,

3) To prepare technical manual and guidelines, containing planning and designing of flood and debris flow countermeasures, applicable not only to the Madarsoo basin but also to similar other basins in the Caspian coastal area, and

4) To pursue technology transfer to counterpart personnel in the course of the study, mainly focusing on planning and designing processes on flood and debris flow disaster mitigation and management.

Throughout the study to be conducted in accordance with the above objectives, the following overall goals will be realized in the study area:

1) The projects, which are proposed through the study, will be carried out and disaster of flood and debris flow will be mitigated, and

2) The Provincial Offices in the Caspian coastal area will conduct the proper planning and designing with necessary measures for flood and debris flow disaster mitigation and management.

1.3 Study Area

The study area is mainly the Madarsoo River basin of the Golestan Province with a drainage area of about 2,300 km^2. In addition the other similar river basins in the Caspian coastal area shall be covered in the study, for instance the Nekka River basin of the Mazandaran Province and the Maslee River basin of the Gillan Province.

1.4 Work Schedule

Fig. 1.1 shows a work schedule of the study. The study started in the middle of October 2004 in a manner of Home Work. Then the field survey in Iran started at the end of October and it will continue until the beginning of September 2006.

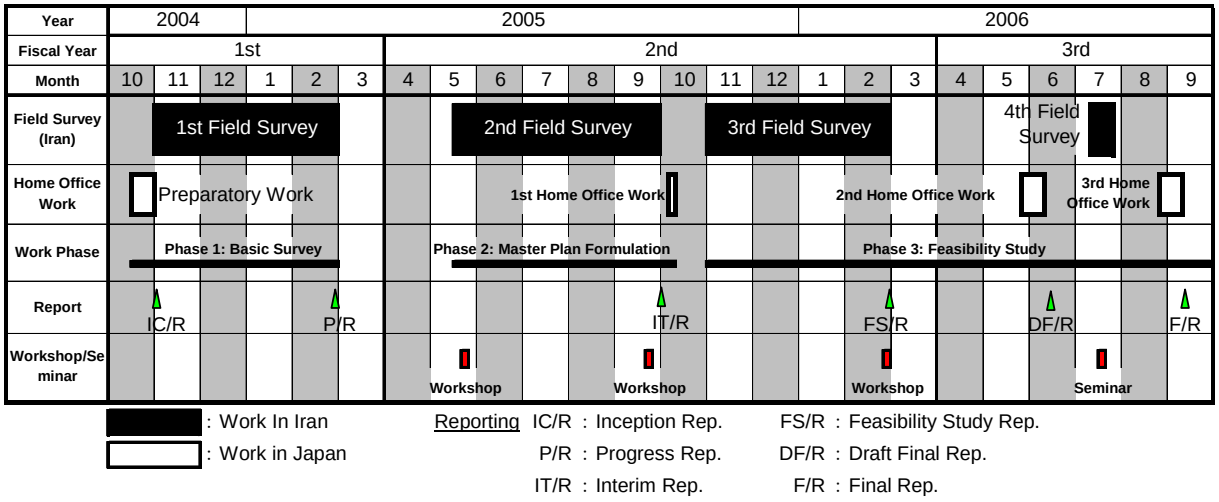


Fig. 1.1 Work Schedule of the Study

CHAPTER 2 PRESENT CONDITIONS OF THE STUDY AREA AND ANALYSIS

2.1 Basin Features

2.1.1 Geographical Feature

The Madarsoo River Basin was defined as a river system connecting to the Gorgan River at Garkar, Minudash, Golestan Province with a main stream originated from the mountain range in Nardein, Semnan Province passing through Dasht, Khorasan Province. In addition, Chesmeh Khan River, one of the tributaries expanding the river basin the eastward, drains meets the main stream at near Dasht downstream. The whole area of the river basin was 2,360 km^2 and located between around 55° 21´ and 56° 28´ in east longitude, and around 36° 58´ and 37 ° 30´ in north latitude respectively.

The feature of the river basin was described in some sectional areas, which had prominent characteristics in meteorological and topographical aspects. They are; (1) Nardein-Sefid Daly, (2) Sefid Daly-Dasht Shad, (3) Dasht-Tangrah, (4) Tangrah-Chahardah Bridge and Chahardah Bridge-Garkar; Ghyz Ghaleh SRB (sub river basin); Dasht-e-Sheykh SRB; Cheshme Khan SRB; Kondoskooh SRB; and Agh Soo SRB.

General Map was shown in Fig. 2.1.

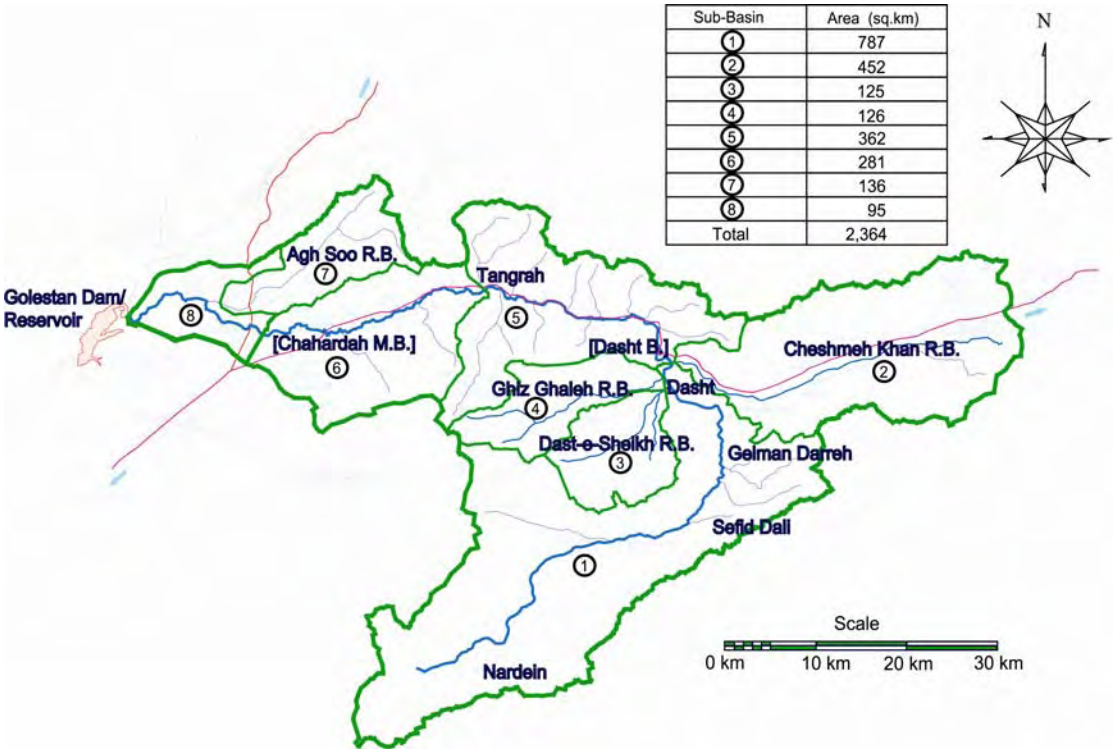


Fig. 2.1 General Map of the Madarsoo River Basin

2.1.2 River Morphological Feature

General Feature

Riverbed longitudinal profile of the main stream taken from topographic maps with a scale of 1/50,000 was around 142 kilometers in length and 1.4 % in average slope, with 4.8 % in mountain side of Nardein, 0.6 % in Nardeen-Sefid Daly plain, 1.2 % from Sefid Daly to Dasht Bridge, 1.9 % shown in Golestan Forest from Dasht Bridge to Tangrah, and 1.1 to 0.7 % from Tangrah to the Golestan Dam Reservoir in average slope respectively. They were shown in Fig. 2.2.

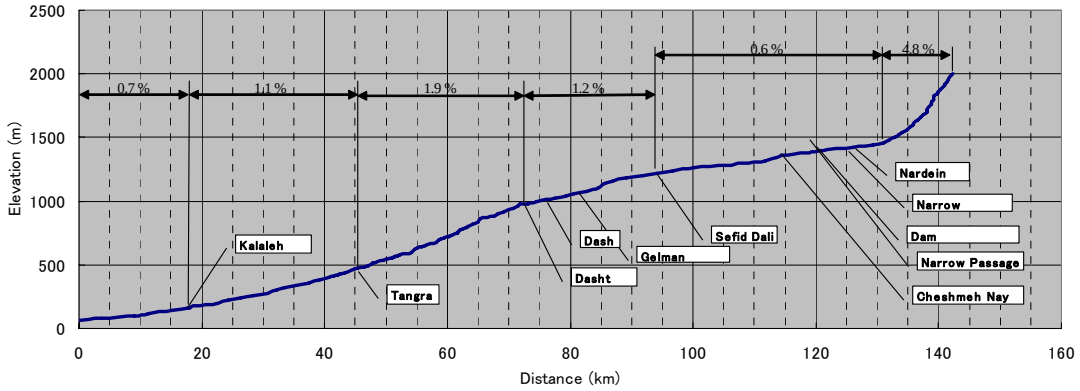


Fig. 2.2 Riverbed Longitudinal Profile of the Madarsoo Main Stream

In comparison with the main stream, some of sub-basins had different feature in longitudinal profile. Ghys-Ghaleh SRB and Dasht-e-Sheykh SRB have steeper slopes than the main stream while Cheshme Khan SRB has a similar slope to the mainstream, as shown in Fig. 2.3.

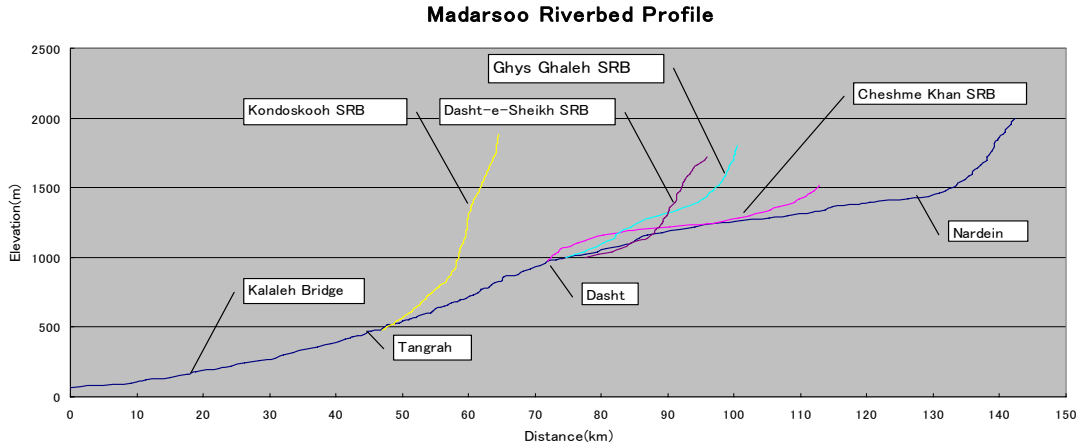


Fig. 2.3 Riverbed Longitudinal Profiles in the Madarsoo River Basin

Between Dasht and Tangrah, many of branches poured into the main stream; Kondoskooh River was one of them, located at downstream-end and holding the biggest catchment in this section.

Main Stream

(1) Nardein-Sefid Dali

In this area, there were no marks found of river flow or riverbed so that the streamline was supposed to connect the bottoms of continuous U-shape shown on the contour lines of topographic map.

Uppermost of this basin was originated from mountains, peaks of which were higher than 2,000 m EL, in the Western side of Nardein with slope of 4.8 % in average. The watercourse from Nardein towards to Northeast passing through a flat plain, located at 1,415 to 1,420 m EL, which once ended at narrow passages before the watercourse reached to Cheshmeh Nay, then via Kahrizli reached Sefid Dali with around 35 km in distance and 0.6 % in average slope. Among the three of narrow passages, at one of which was placed dam construction by MOJA Semnan.

Though these passages, no marks of river flow like sand and gravel remained also were found except small ditches with less than 1 m in width.

At Nardein, qanat was found but it has already been abolished because of no water underneath.

Result of the total observation suggested that the flat plain have worked as retarding basin to flood flow so that this area have not contributed causing flood to the downstream areas.

There were some existing check dams on the hillside and groundwater recharge ponds in mouths of valleys at the south side of the basin and dam construction was on-going at one of the narrow passages.

The narrow path at Nardein Plain

The narrow path at Cheshmeh Nay

The narrow path at Safid Dali

Dam construction site of MOJA Semnan at one of the narrow paths

(2) Sefid Dali-Gelman Darreh

At Sefid Dali, the main stream entered the narrow passage toward Northeast and changed direction to North then went out to Gelman Darreh, where the east end of Dasht Plain. Over the riverbed near Gelman Darreh was accumulated thick sediment. This section had 1.2 % in average slope and 20 km in distance. There was clear riverbed with sand and gravel found in the watercourse at Gelman Darreh. According to the site observation and aerial-photo interpretation, the river course was meandering and the riverbanks were vulnerable to erosion in this section.

Farmland had been developed in this area, which had suffered floods and sediment deposition in the 2001 and 2002 Floods so that temporary dike was constructed with sand and gravel collected from the riverbed nearby. The trace of the flood flow and sediment deposition was not seen in the area at the east end of Dasht Plain.

Result of the site observation and aerial-photo interpretation suggested that the flood flow in this area have affected this sectorial area itself with sediment deposition over

the farmland, but have not had much contributed causing of flood against the downstream.

Sediment deposition at Gelman Darreh

Temporary dike at Gelman Darreh

(3) Gelman Darreh-Dasht

In this section with around 10 km in distance along the stream line, the main stream merged the sub-river basins of Dasht-e-Sheikh and Ghyz Galeh going to the East and met the sub-river basin of Cheshmeh Khan at the right upstream of Dasht Bridge. Riverbed was meandered in Dasht Plain, which mostly had been cultivated into farmland. Both of the exits from the main stream and Cheshmeh Khan River at the junction area had relatively narrow forming valley shapes. The topographic feature suggested that this area had function of retarding effects to flood for downstream area.

Dasht village had suffered serious damages in human lives and farmland from the 2001 flood. Flood flow attacked the village from four ways, two came from Ghyz Galeh, one came from Dast-e-Sheikh and the other came from Gelman Darreh as shown in Fig. 2.4. Some of dams had collapsed in those river basins during the flood but their effects to the flood could not been specified due to lack of solid evidences.

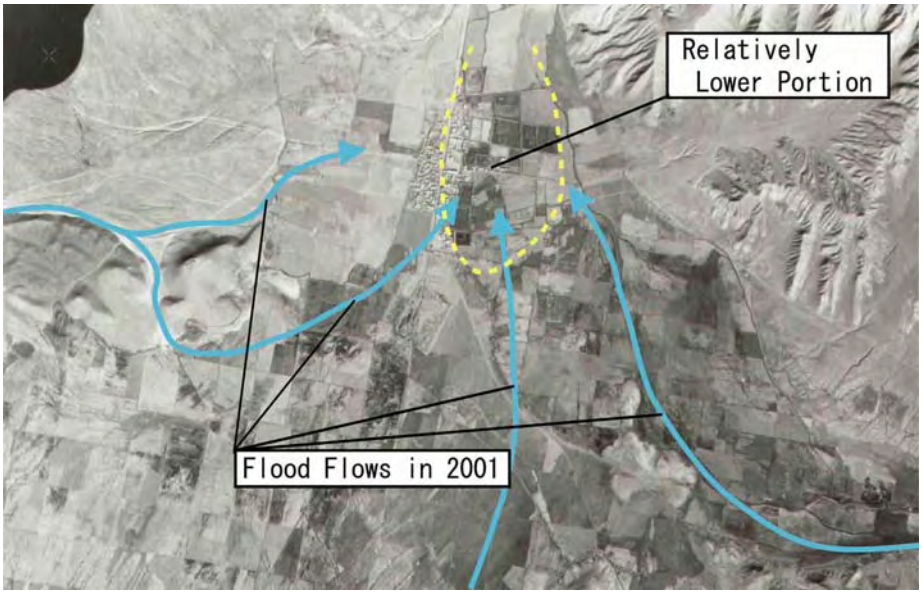


Fig. 2.4 Flood Flows in Dasht during the 2001 Flood

This image was prepared based on the information from interview to the villagers and site observation without topographic survey.

(4) Dasht-Tangrah

After the junction of the mainstream and Cheshmeh Khan, the main stream runs through the valley of Golestan Forest and reaches at Tangrah with around 35 km in distance and 1.9 % in average slope. On the way of the streamline in this area, the stream and the main road conflicted in the narrow passages each other. Some of the geological fans, projected to the stream and exposed to the river flow attacks, were eroded at toe portion with 5 to 6 m in height of sediment deposition layers. According to the aerial-photo interpretation, the road had been placed on the fans vulnerable to erosion; bridges had had narrow span or culverts that caused to chalk the river courses in some locations.

(a) Dasht-Chesmeh Khan Junction Area

Entire area at junction of the main stream and Cheshmeh Khan River was exposed of soil layer with 5 to 7 meters in height. It was molded by erosion during the 2001 Flood and expanded by the 2002 Flood while it had been deposited with thick sediment before the 2001 Flood. (See Fig.2.5.)

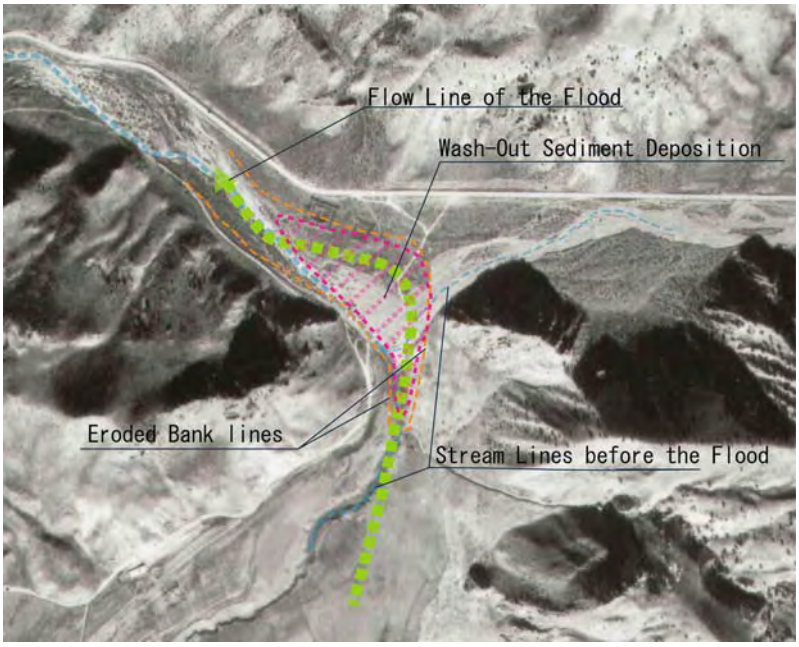


Fig. 2.5 Bank Erosion in Dasht Junction Area

The face of the eroded banks was vertically dropped with sand and gravel deposition so that it was vulnerable to further erosion developing toward to the upstream, farmlands in Dasht and Cheshmeh Khan. (See Fig. 2.6.)

Result of the site observation and aerial-photo interpretation in this area suggested that; the junction area had been placed with sediment deposition, which had clogged the exits of the both rivers before the 2001 Flood; and the collapse of the deposition had intensified a power of flood during the 2001 Flood; and the bank erosion in this area would be developed toward to the farmland upstream by the future floods.

South-end of the erosion in Dasht junction

Facing to the Cheshmeh Khan River mouth

Fig. 2.6 Photos of Erosion Site in Dasht Junction Area

(b) Narrow Passages

One of the critical points on confliction between river flow and road was shown with the photo in Fig. 2.7.

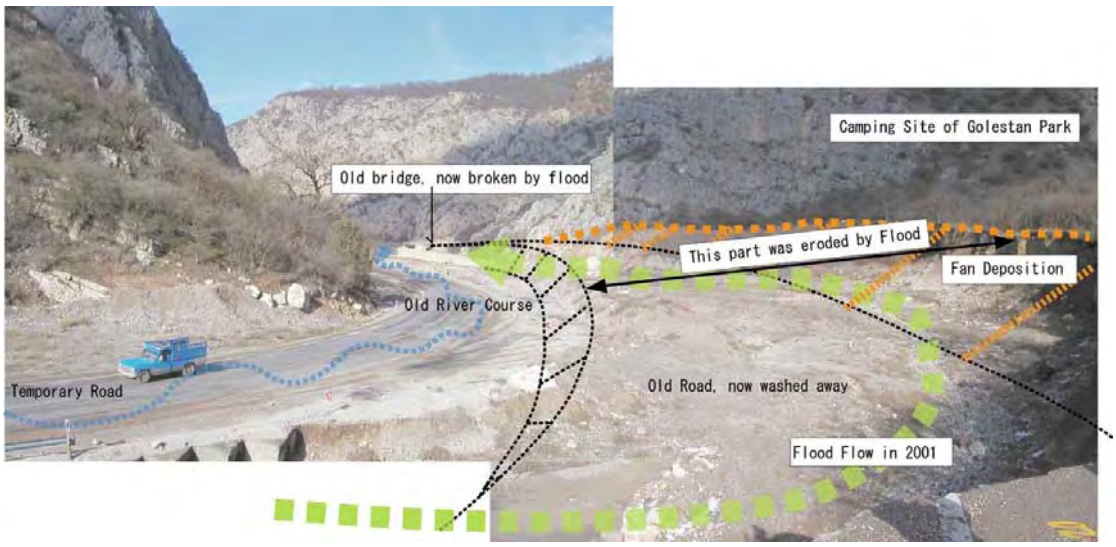


Fig. 2.7 One of the Critical Points on Confliction between River Flow and Road

This narrow passage had been formed by a fan deposition at the right bank and solid rock at the left bank. The road had been located on the top of the fan area extending downstream with concrete wall and bridge. The flood flow was dam-upped in the narrow passage and intensified in its velocity to wash away the right bank deposits with the road mounted on the fan plain. The temporary road and river flow now intercrossed each other at the narrowest part in this area, which was the most critical part on confliction between river and road among the narrow passages along the Madarsoo River.

The following photo also shows that the old road had chalked the river course with its banking and been washed away by the 2001 Flood flow, water level of which had been risen in the narrow passage and intensified by the chalking.

Fig. 2.8 Road Bank Once Chalked the River Flow and Washed Away by the Flood

The following aerial-photograph presented the image of one of the narrow passage of the Madarsoo River in this area. The fan had spread into the riverbed to narrow the river course. White colored trace showed the old road and bridges that had narrowed the river flow passage. They were broken and washed away clearing with sediment deposition accumulated in the riverbed.

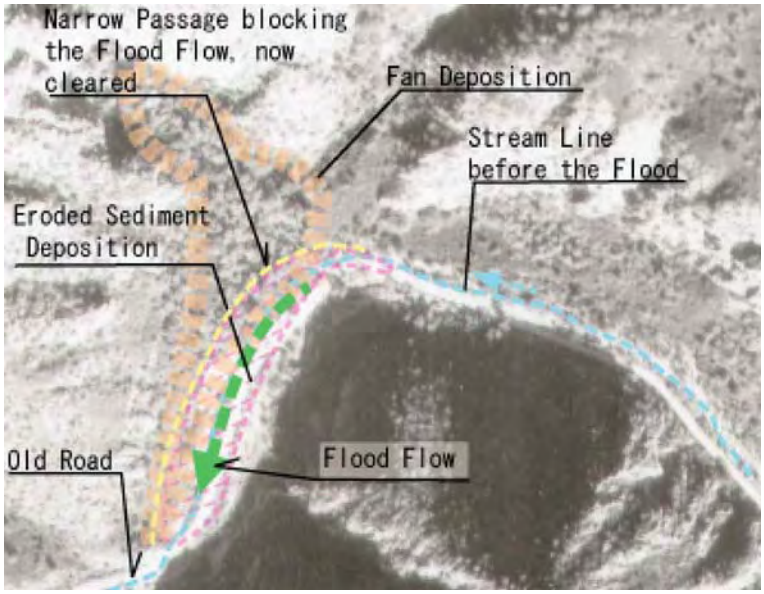


Fig. 2.9 Aerial-photo for One of the Narrow Passages in the Madarsoo River

Result of site observation and aerial-photo interpretation suggested that; the confliction of river and road/bridges and the fans had blocked the 2001 flood flow; and once such blockages were broken and intensified the flood to the downstream.

After the 2001 flood, the main road was restored. Relocated road positioning suggested the road have much more risks for flood to overflow the road because the new road was constructed without elevated banking and bridges. In addition, further erosion would be developed in the scoured portions because the faces of eroded soil layers were exposed against the river flow.

(c) Tributaries

There were tributaries draining from valleys into the mainstream from both of the north and south sides. Their catchments were mostly well covered in forest. Tracing debris suggested that some of them had disturbed the mainstream flow with debris flashed out form the valleys. They were at Khondoskooh Valley and Golestan Valley. Traces of debris flashed out were shown in Fig. 2.10.

Debris spread in the main stream at junction area with Kondoskooh River

Debris spread in the main stream at junction area with Golestan Camp River

Fig. 2.10 Photos on Debris Flash-out from Tributaries in the Madarsoo River

(d) Road Condition

The main road is located mostly in the flood plain of the Madarsoo River in this area. After the 2001-2002 Floods, the main road was rehabilitated in temporary way. Pavement was restored and bridges were replaced with culverts. In case culverts did not have enough capacity for probable flood flow, mostly looked so, the portions of the main road would be overflowed by the flood flow. Some of such portions were shown with photos in Fig. 2.11.

Culverts for traffic at risk with flood

Fig. 2.11 Photos on the Temporary Road and Bridges in the Golestan Forest

(5) Tangrah-Chahardah Meter Bridge

(a) Mainstream

The mainstream of Madarsoo River in this area was running from the east to west meandering in the floodplain, which was wider in width and gentler in slope. It was distinguished from the immediate upstream, Golestan Forest area, in river-morphological viewpoint. The meandering had been causing bank erosion in some locations, which had been damaged in the 2001 and 2002 Floods. Their locations and conditions were described as follow.

Table 2.1 Summary on Bank Erosion in Tangrah-Chahardah Meter Bridge

Location	Condition	Remarks
Tangrah	The flow attacked the RHS bank, where the main road was located	
Terjenly	The flow attacked the RHS bank, where the main road and farmland located. The latter was eroded.	
Loveh	The flow at the bridge attacked the LHS bank upstream and RHS bank downstream. Farmland and residence land were eroded. Bridge was provided with spillway at the RHS	
Korang Kafter	The flow was meandering and flow capacity was not enough for requirement at the bridge.	
Chahardah M. Bridge	South side of the bridge was lost by overflow of the floodwater in the 2001 Flood. Road was restored but still flow capacity was not enough for requirement at the bridge.	

Note: RHS; right hand side, LHS; left hand side

(b) Tributaries

There were many valleys in both of banks along the Madarsoo River in this area. In the north side slopes, some of them had flushed debris out of the valleys into residents and road, causing lost human lives and traffic disturbance. They were in Terjenly and Beshoily.

Debris flashed out through the ditch

Deposition of debris in upstream area

Fig 2.12 Photos on Debris in Terjenly

(6) Chahardah-Gorgan Dam Reservoir

The flow was meandering in the floodplain and 2001-2002 Floods had inundated over the farmland in this area. The former had caused bank erosion like at Kalaleh Bridge and the latter had caused to damage farming management.

Chesmeh Khan River

Chemeh Khan River SRB defined the east end in the Madarsoo River basin. Wild land of this basin was entirely covered by semi-arid grass. The streamline runs from east to west in the

middle of this SRB in parallel to the main road. In the North side of the road was located in the Golestan National Park and in the South side was farmlands irrigated in some areas. Mountains of the both side had riles widely developed suggesting much production of sediment. The watercourse in this area had no trace of recent flood flow.

Weathered rock at right bank

Niles in hills at left bank

Fig.2.13 Photos on Debris Potential in Chesmeh Khan

Ghyz Galeh River

(1) General

The route of the Ghys Galeh River was originated from the mountain nearby Dast-e-Shah at around 1,800 m EL running to the east.

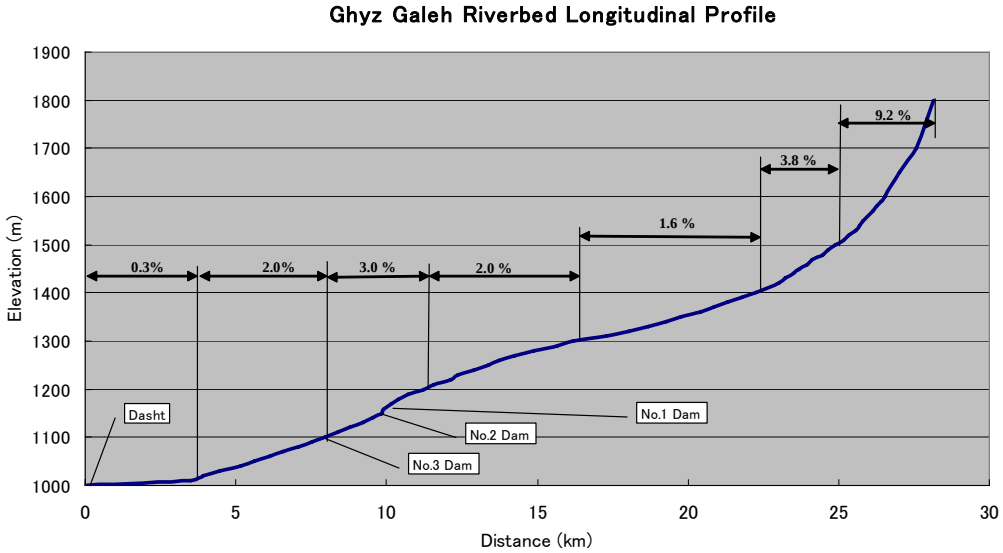


Fig. 2.14 Longitudinal Profile of Ghyz Galeh River

Along the route from the top to the area at around 1,200 m EL was the bank exposed to erosion by thick debris deposit with sharp slopes at the both sides of bank.

Downward from the elevation around 1,200 m, geological fans projected into the river course from the valleys in the north side or the left hand side bank, toes of which had been scoured. There were sediment depositions in more than 5 m thick in the riverbed that were made naturally by boulder blockages and artificially by dam construction. They were mostly breached and the exposed faces of sediment deposit would be scoured in the further floods.

Farmland near Dast-e-Shad at 1,500 m EL

Sediment deposit at 1,300 m EL

Fig. 2.15 Photographs Showing Upstream Area of the Ghyz Galeh River

(2) Existing Facilities

There were three (3) dams along the mainstream of this basin, which had been breached and had no function to store water. They were supposed to be named by Ghiz Galeh No.1, 2 and 3 dams in order from upstream. Feature of the dams were described below.

(a) Ghiz Galeh No. 1 Dam

The dam had been constructed on hard rock at RHS bank, on debris deposition at LHS bank, which had been supported by large stone. In the reservoir area was accumulated sand and gravel with 5 to 6 m in depth and 1 m in maximum particle size. The perimeter of the reservoir area had been grown with bushes, which had been apparently watery plants different from those on the hillside.

Presently the bottom of the dam basis was seen with 7 m in height from the riverbed. There was a concrete structure remained at RHS bank, which was supposed to be a spillway. The structure had stepwise chute provided. The embankment shape could be traced to the stamp of covering area of the dam material on the RHS abutment, which suggested the dam type was earth-fill dam.

The ruin of the dam suggested that the destruction of the dam was caused with washed out of the foundation material under the dam bottom, which was forced by high water level.

Restoration of the dam could not be made at the same location because debris accumulation at LHS bank could not bear water pressure of the supposed reservoir. Topographical and geological feature suggested that reconstruction work of the same kind dam as the previous one was supposed to place at just upstream of the previous one, if it was required. Photos of the GG-1 Dam were shown below.

	
The bottom of the dam was looked up at.	The reservoir area

Fig. 2.16 Photos on Ghyz Galeh No.1 Dam

(b) Ghiz Galeh No.2 Dam

There was masonry wall remained between big stones but anything else did not remained. The surrounding area was occupied with big stones, which suggested that purpose of the dam construction was to capture stones in relatively big size.

Topographical and geological feature suggested that reconstruction work of the same kind dam as the previous one was supposed to place between hard rock exposed both of RHS and LHS banks, if it was required.

	
Remaining wall viewed from downstream	Upstream area.

Fig. 2.17 Photos on Ghyz Galeh No. 2 Dam

(c) Ghiz Galeh No.3 Dam

Ghiz Galeh No.3 Dam had been founded on the hard rock at RHS bank, on sand and gravel layers at middle and on the debris accumulation at LHS bank. The dam was constructed with earth fill. Spillway was provided at LHS bank with excavated channel. At RHS bank was provided with excavated channel for intake to supply water for the banquette cut on the hillside. In the reservoir area was accumulation of sediment, which was vulnerable to erosion.

The dam feature suggested that purposes of the dam were sediment control and water supply for watershed management.

There were so many traces of erosion along the top of the dam, which suggested that water had flowed over the top. The dam was widely opened at the boundary of foundation between rock and riverbed materials.

Causes of the dam destruction were supposed to be as follows:

- Overtopping of river flow
- Piping through the embankment or riverbed.

The former was probably caused by shortage of spillway capacity, which was forced by blocking of plant trunks and sediment flashed out from the valley located at the entrance of the spillway, or by the design capacity itself.

The latter was also probable cause. Presently, the stream flow was observed in upstream while it disappeared at the dam site, which suggested that it was flowing under the riverbed. During flood, high water level was supposed to force velocity under ground flow faster enough to cause piping phenomenon.

Therefore, it was required for reconstruction or rehabilitation of the previous dam that revision of design and location of the spillway and design of foundation treatment be taken into account.

Opening of the earth-dam viewed from downstream

Part of the spillway

Intake area for banquette

Reservoir area

Fig. 2.18 Photos on Ghyz Galeh No.3 Dam

(3) DOE Jurisdictional Area

There were some geological fans developed in the DOE jurisdictional area. They had been transformed by the flood flows (please see Fig. 2.19). Fan A had been

developing and producing sediment while Fan B had been well developed and resting the production. Fan C had started accumulation of sediment. Recent flood had attacked and scoured Fan A and B supplying sediment to the Fan C.

Probable flood would further more produce sediment in Fan A and scour the eroded bank of Fan A and B, and supply sediment to Fan C.

In the Area D could be provided some capacity to store sediment transported from the upstream if additional structure was provided.

There were some traces of water path of runoff, stream flow or spring water in the south side of hills bordering the basins between the Ghiz Galeh and the Dasht-e-Sheikh. They were suggesting possible water source for Dasht Plain.

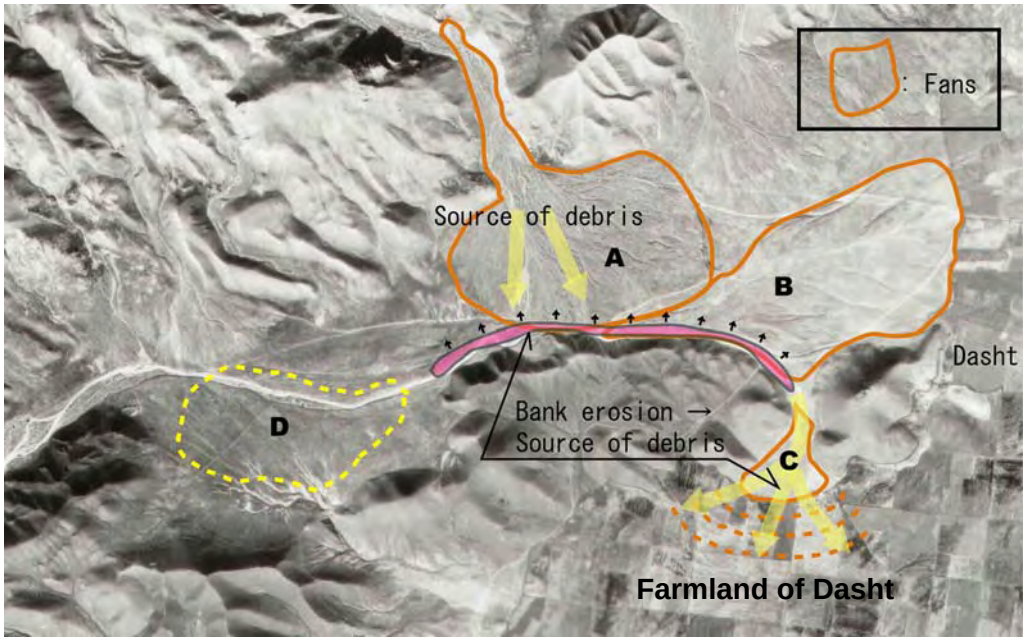


Fig. 2.19 Topographical Feature Taken from Aerial-photograph in DOE Jurisdiction Area

Dasht-e-Sheikh River

(1) General

The Dasht-e Sheikh River Basin is surrounded with mountain ranges bordering from the Sefid Dali-Nardein basin at the south and from the Ghyz Galeh at the north. Almost whole area in this basin is bare land exposed with soft rock and sediment layers, and accordingly vulnerable to erosion. The tributaries are spread like nervures of leaf, which are channeled with V shapes and draining to the mainstream of the Madarsoo River just upstream of Dasht Village. The longitudinal riverbed profile of one of the longest tributaries is shown below.

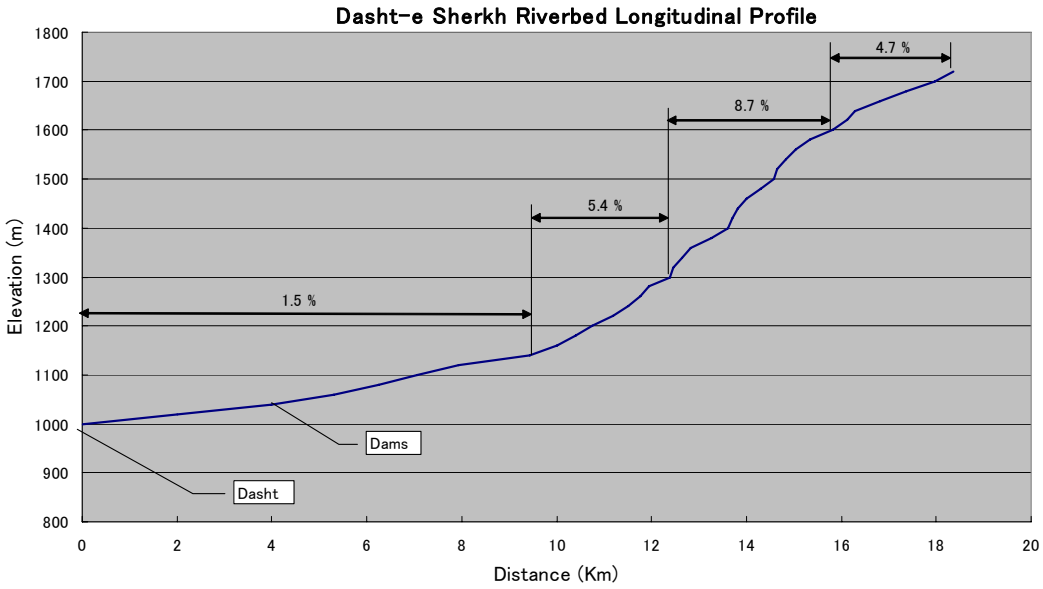


Fig. 2.20 Riverbed Longitudinal Profile of Dasht-e Sheikh River

(2) Existing Facility

There had been two (2) dams existing at Sajman Mashhdi located between Dasht and Bidak but breached by the 2001 Flood and lost functioned completely. They were supposed to be named by Dasht-e-Sheikh No.1 and 2 dams in order from upstream.

Both dams were constructed of earth-fill. Spillway had not been seen in observation. Traces of scouring suggested that destruction was caused with overflow of floodwater as well as piping under ground.

Dasht-e-Sheikh No. 1 Dam viewed from upstream

One of the breach sections

Fig. 2.21 Photos on Dasht-e-Sheikh No.1 Dam

2.1.3 Summary on Encountered Situations

Encountered situation is described based on the analysis on the basin feature, and the results are summarized in the following table.

Table 2.2 Summery of Encountered Situations in the Madarsoo River Basin

	Section	Encountered Situation	Required Countermeasures	Remarks
1	Nardein - Sefid Dali	Positive; Natural retarding effect to flood for downstream area	Dams at bottlenecks can increase the retarding effect.	Not much information because coordination with Semnan was not established.
		Negative; Erosion in hillsides, Shortage of water resources	Watershed management	
2	Sefid Dali - Gelman Darreh	Negative; Erosion in hillsides	Watershed management	
3	Gelman Darreh - Dasht	Positive; Natural retarding effect to flood for downstream area		
		Negative; Flood in Dasht Village and farmland. Debris flow from Ghyz Ghaleh into farmland	Flood Control Dike Watershed management in Ghyz Ghaleh and Dasht-e-Sheikh	
4	Dasht - Tangrah	Negative; Flood on road & bridges Bank erosion along the mainstream Erosion in hillsides Debris flows from the tributaries disturbing residents, traffic and river flow.	Relocation/Elevation/ Warning River training Watershed management	Required to coordinate with DOE, MOE & MORT for any works Required to coordinate with MORT, DOE, Golestan Province, and Police for warning system works to control traffic.
5	Tangrah – Chahardah M. B.	Negative; Flood Bank erosion along the mainstream Erosion in hillsides	Land use with hazard map and warning system River training Watershed management including check dams in hillsides	
6	Chahardah M.B – Kalaleh B.	Negative; Flood Bank erosion along the mainstream Erosion in hillsides	Land use with hazard map and warning system River training Watershed management including check dams	
7	Kalaleh B. — Reservoir	Flood on farmland Bank erosion along the mainstream	Hazard map & education/ dissemination River training	
8	Cheshmeh Khan	Negative; Erosion in hillsides Shortage of water resources	Watershed management	
9	Ghyz Galeh	Negative; Erosion in hillsides Flood on Dasht Village Warer shortage Breach of existed dams	Watershed management including check dams and Sabo works	Required to review the design on foundation and spillway in dam construction
10	Dasht-e-Sheikh	Negative; Erosion in hillsides Flood on Dasht Village Water shortage Breach of existed dams	Watershed management including check dams	

2.2 Socio-Economy

2.2.1 Socio-Economic Profile in Iran

Social Profile

(1) Demography

Iran's total population is estimated at 66.4 million and its growth rate is 1.5% in 2003 according to the World Bank. Iran has the second largest population, after Egypt, in the Middle East and North Africa region. The census data of Iran shows that the average annual growth rate has been decreasing with the exception in 1986. The exception may be attribute to the Iran-Iraq War, which was continued over 1986. When the regression analysis is made, the characteristic of the exception in 1986 is clarified.

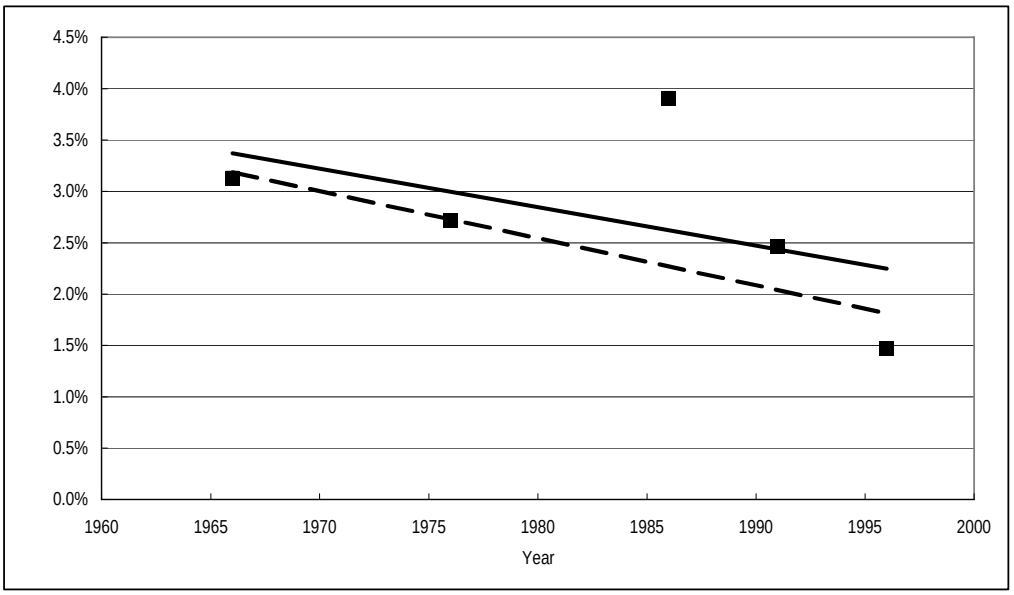
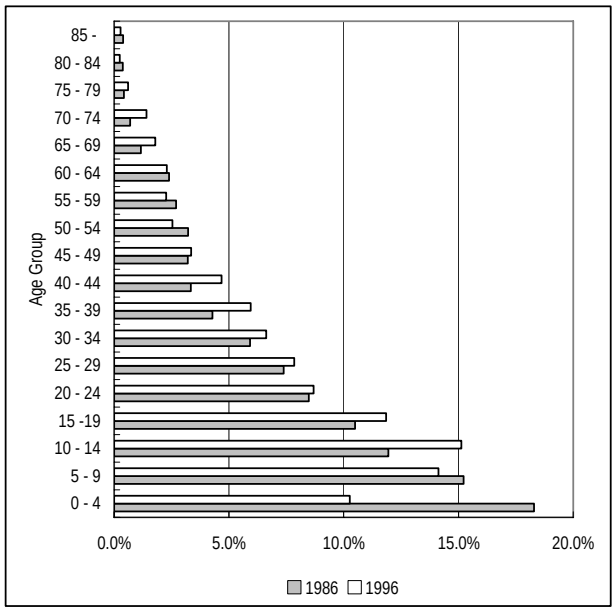


Fig. 2. 22 Regression Analysis of Iran's Population Growth

The R^2 value, which shows the ratio of variation explained by the regression model, of the data group with 1986 data is 0.234 while that without 1986 data is 0.775.

The population composition changed drastically between 1986 and 1996 as the share of 0 to 4 year old group reduced from 18.3% to 10.3%. The reason for the decrease in population growth can be a decline of birth rate taking into the consideration of the relatively lower infant mortality rate of Iran.



Source: Iran Statistic Year Book 2001

Fig. 2. 23 Population by Age Group in Iran

(2) Other Social Indicators

Following social indicators shows preferable profiles of Iran with the comparison of other Middle East and North African Countries: life expectancy, infant mortality, access to an improved water source and gross primary education enrolment. In addition almost all of them are better than the average of lower to middle income counties. The World Bank's *Country Brief, September 2004* describes that Iran's health and education indicators are the best in the region. Furthermore, lager numbers of increasingly well-educated women seek opportunities to participate all levels of Iran's labor market and civil society. This is another side of the successful social policy of Iran. It is a new challenge for the Government to cope with in order to manage a stable economy and society

Table 2.3 Major Social Indicators of Iran

	Iran	Middle East & North Africa	Lower-middle Income
Ave. Annual Growth (1997-2003)			
Population (%)	1.5	1.9	0.9
Labor force (%)	2.9	2.9	1.2
Most recent estimate (latest year available, 1997-2003)			
Poverty (%of population below national poverty level)	21	-	-
Urban population (% of total population)	67	58	50
Life expectancy at birth (years)	71	69	69
Infant mortality (per 1,000 live birth)	30	44	32
Child malnutrition (% of children under 5)	11	-	11
Access to an improved water source (% of population)	99	88	81
Illiteracy (% of population age 15+)	15	31	10
Gross primary education enrolment (% of school-age population)	98	96	112
Male	102	100	113
Female	95	92	111

Source: World Bank

Macro-economy and Governmental Finance

As many people, the oil and natural gas production shares expect it is considerably high in Iran's national economy. The share of oil production exceeds 11% of total GDP. The share of revenue from oil and gas dominates the Governmental budget, which posted 30 - 50%.

Table 2.4 Oil and Gas Production in Iran's Economy

	1996	1997	1998	1999	2000
Share of Oil in GDP	12.9%	12.3%	11.9%	11.0%	11.6%
Share of Oil and Gas in Revenues of Governmental Budget	52.7%	36.6%	30.2%	24.5%	47.8%

Source: *Iran Statistical Year Book, 2002*

GDP growth rate was relatively lower in 1980s - 1990s. In 2000's, this trend changed thanks to a higher oil prices. The World Bank expects that this higher growth will continue for the next five years.

Table 2.5 GDP Growth Rate

Average Annual Growth (%)

	1983-1993	1993-2003	2002	2003	2003-2007 *
GDP	2.2	3.7	7.4	6.6	5.7
GDP per capita	-0.5	2.2	5.7	5.2	4.1

*: Forecast
Source: World Bank

In addition, the deficit of Governmental budget improved remarkably to -0.2% of GDP in 2003 although it is still in red ink. The reason is the result of expenditure cuts, particularly capital expenditures according to the World Bank.

Table 2.6 Government Finance

	1983	1993	2002	2003
Government finance (% of GDP)	-6.3	-6.1	-2.4	-0.2

Source: World Bank

On the other side of the strong economic growth, Iran did not succeeded in the control of inflation.

Table 2.7 Inflation Rate

	1983	1993	2002	2003
Consumer prices (% change)	20.5	21.2	15.8	15.6

Source: World Bank

Iran's economic structure also changed in 2000s as the share of Agriculture reduced to around 11% from 20% in 1980s - 1990s. On the other hand, the share of Industry increased from 40s % from 30s % while the services sector kept around 50% during the same period.

Table 2.8 Structure of Economy

(% of GDP)

	1983	1993	2002	2003
Agriculture	18.1	20.8	11.7	11.3
Industry	34.9	36.2	40.6	41.2
Manufacturing	8.8	13.6	12.0	12.5
Services	47.0	43.0	47.7	47.5
total	100.0	100.0	100.0	100.0

Source: World Bank

Five-Year Development Plan

The Iranian economy is managed with the Five Year Development Plan in accordance with the Constitution. The third FYDP started in 2000 and ends in 2005. The Plan targets annual 6% growth rate in its period. On the other hand, the Plan continues to emphasize social development and equity. In order to expand the economic growth potential, increase the living standards of the population, and reduce unemployment, the Plan envisages a wide range of structural reforms aiming at a balanced and gradual transition to a market economy. Such reforms are summarized as follows:

Table 2.9 Reforms of the Third Five-Year Development Plan (2000-2005)

Sector	Agenda
Economy	Pricing system reform: 1. the unification of the multiple exchange rate system; 2. trade liberalization; 3. competitive allocation of credit, and positive interest rates; and 4. addressing the issue of the large energy subsidies. Private sector-based development: 1. strengthening the legal and institutional framework; 2. reducing the size of the public enterprise sector through privatization and public enterprise reform; 3. starting the reform of the state-dominated financial sector; and 4. strengthening of mechanisms of social protection to limit the negative transitory effects of the reforms.
Social	1. Empowerment-based poverty reduction, 2. Improving the efficiency of the Social Safety Net, and 3. Addressing the social costs of reforms,
Environmental and Water Resource Management	Urban environment: 1. Sewerage system development 2. Air pollution prevention Rural Environment: 1. Groundwater management 2. Efficient irrigation network 3. Integrated river basin management etc.
Governance and Transparency	1. Granting much more freedom to the press, 2. Reforming the budget nomenclature, process, and control mechanisms and institutions, and 3. Regulation of monopolies and promote competitive economic activities

Source: *Interim Assistance Strategy for the Islamic Republic of Iran*, World Bank, 2001

2.2.2 Socio-Economic Profile in Golestan Province

Socio-economy

(1) Demography

Population growth shows different trend between the rural area and urban area. The growth rate of the urban area had been decreasing continuously while that of rural area had fluctuated in the past. As it is shown in the national data, even the rural area implies some declining trend if we consider the 1986 data is an exception. The 1976 data is 1.45% and the 1996 data is 1.43% when the further decimal digit is calculated. In addition, it should be noted that the urban growth rates are generally higher than the rural rates.

Concerning the average number of family members that of urban area has the trend of decreasing except 1986 while that of rural area has the trend of increasing. It is

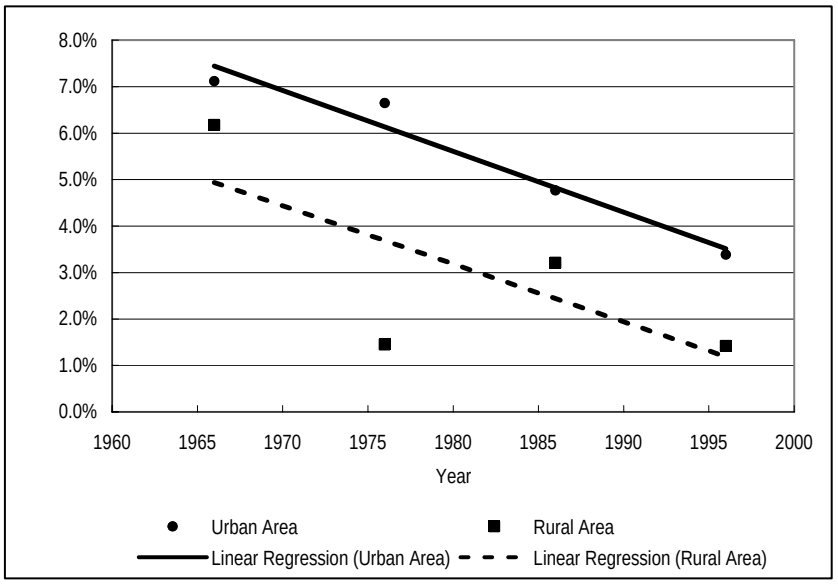
noticeable that the number is higher in urban area than in rural area in early years and the figures had reversed from 1976. With an assumption that urbanization reduces the number, the urbanization in the "urban area" started in 1970s. On the other hand, the agricultural production of household has been feeding more and more family members in the rural area.

Table 2.10 Summary of Population in Golestan Province

	1956	1966	1976	1986	1996
Urban Area					
Populaiton	70,034	139,268	265,032	422,193	588,985
Ave. Annual Growth Rare		7.1%	6.6%	4.8%	3.4%
No. of Families	9,548	26,896	51,606	80,050	119,343
Ave. Pop per Family	7.33	5.18	5.14	5.27	4.94
Rural Area					
Populaiton	250,147	455,267	525,574	721,147	830,171
Ave. Annual Growth Rare		6.2%	1.4%	3.2%	1.4%
No. of Families	56,914	88,879	95,035	120,600	148,143
Ave. Pop per Family	4.40	5.12	5.53	5.98	5.60
Total					
Populaiton	320,181	594,535	790,606	1,143,340	1,419,156
Ave. Annual Growth Rare		6.4%	2.9%	3.8%	2.2%
No. of Families	66,462	115,775	146,641	200,650	267,486
Ave. Pop per Family	4.82	5.14	5.39	5.70	5.31

Source: *Golestan Statistic Year Book, 2001*

Although the 1986 data is deemed an exception, it may not be excluded for the regression analysis because the data number is extremely few and the R^2 value does not improve or does only a little (from 0.960 to 0.957 for the urban data and from 0.516 to 0.571 for the rural data). The R^2 value of the urban data is high but that of the rural is not preferable, which means the linear regression model does not explain the data variation of the latter successfully.

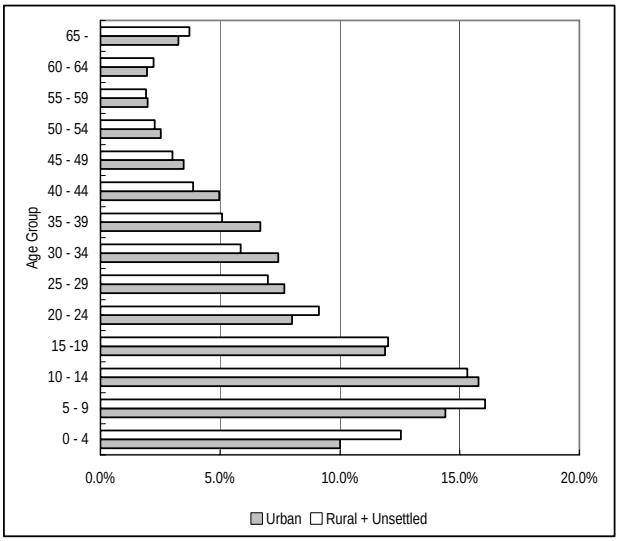


Source: *Golestan Statistic Year Book, 2001*

Fig. 2. 24 Regression Analysis of Golestan Province's Population Growth

For the population composition, the same thing can be said with the national data both for the urban area and the rural area. Namely, the decrease in population growth can

be a decline of birth rate taking into the consideration of the relatively lower infant mortality rate of Iran.



Source: *Golestan Statistic Year Book, 2001*

Fig. 2. 25 Population by Age Group in Golestan

(2) Inflation

As it is shown in the national economy, Iran's one of the challenge in the economic management is to control the inflation. It is the same story for Golestan Province. In the urban area, inflation is lower than the total of Iran while it is considerably higher in the rural area with indicating more than 20%. Higher inflation items are Health and Medical care in the urban area with 21.5% and those in the rural area are Health and Medical Care, Transportation and Communication, Closing and Footwear, and Food, Beverages and Tobacco.

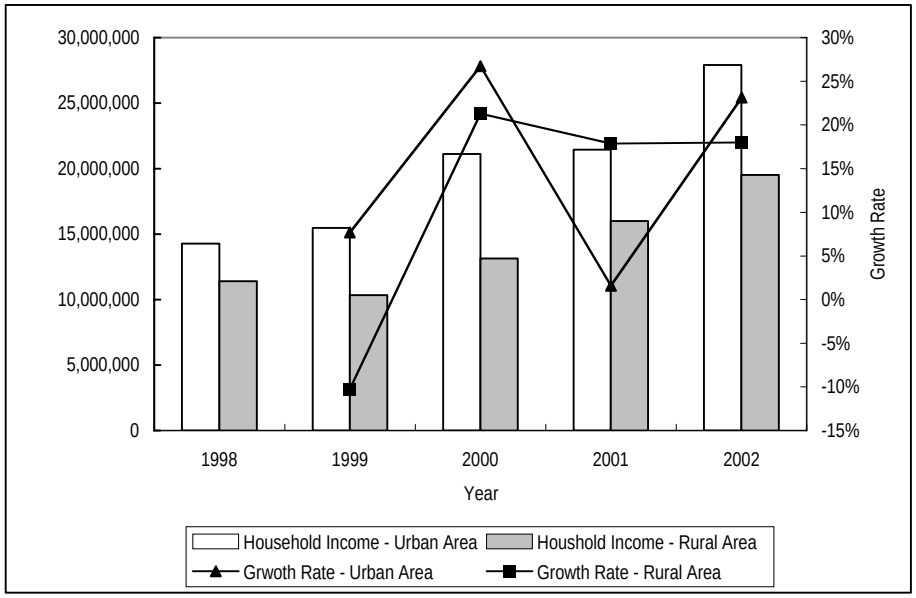
Table 2.11 Inflation Rate by Area Type

	Total Index	Food, Beverages and Tobacco	Closing and Footwear	Fuel and Light	Housing, Furnishings and Household Services	Transportaion and Communication	Health and Medical Care	Recreation, Enternainment & Education	Miscellaneous Goods and Services
Urban									
Golestan	13.8%	14.8%	3.0%	15.2%	9.1%	13.6%	21.5%	10.2%	20.0%
Iran	15.5%	15.6%	6.2%	19.2%	9.2%	14.3%	20.6%	14.0%	17.0%
Rural									
Golestan	25.8%	26.2%	26.3%	25.8%	21.2%	27.8%	28.0%	22.3%	24.3%
Iran	18.9%	17.7%	19.3%	21.0%	14.4%	20.6%	27.1%	17.5%	18.7%

Note) Urban: Average annual growth of Consumer Price Index between 1997 and 2001
Rural: Average annual growth of Consumer Price Index between 1995 and 2001
Source: Central Bank of the Islamic Republic of Iran

(3) Household Income

The household income has been increasing except that of the rural area in 1999. However, it should be noted that the figures are based on the current prices. It means that the real income decreased considering the high inflation rate. In addition, the growth rate drastically fluctuated especially for the rural income, which causes hardship to the people.



Source: Management and Planning Organization of Golestan

Fig. 2. 26 Annual Average of Household Income by Area Type

(4) Other Socio-economic Indicators

Golestan Province can be generally ranked at the middle of all 28 Province/Administrative Divisions. Its agricultural production such as wheat is ranked at a higher level. It is noticeable that the number of medical beds per 100,000 population is ranked at the lowest level.

Table 2.12 Socio-economic Indicators

	Area (sq km)	Rank	Population in 1996	Rank	Average Production of Wheat 2000-01 (1,000 tons)	Rank	Manufacturing Establishments with 10 or More Workers in 2000	Rank	Number of Medical Beds per 100,000 in 2001	Rank	Government Budget (Current + Development) in 2000	Rank
Golestan	20,893	19	1,426,288	15	723	4	159	17	115	27	667,861	16
Tehran	19,196	22	10,343,965	1	194	15	2,716	1	279	1	3,203,868	1
Iran Total	1,629,805		60,055,488		9,458		11,200		182		26,850,497	

Source: *Iran Statistical Year Book, 2001*

Governmental Finance

(1) System of the Government Budget

The budget of each financial year is estimated in the previous year by Planning and Management Organization and then offered to the Council of Ministers and then delivered to the Islamic Parliament (Majilis-Shura Islami) as a legislative bill. In accordance with changes in economic, social and political conditions as well as changes in receipts and payments by the Government, which cause the changes in the activities of governmental organizations, the Government sends a complement bill of budget to the National Consultation Assembly. This bill should be approved before the end of year. Final budget is specified after the end of each financial year in accordance with the final receipts and payments. The Governmental budget consists of the following items.

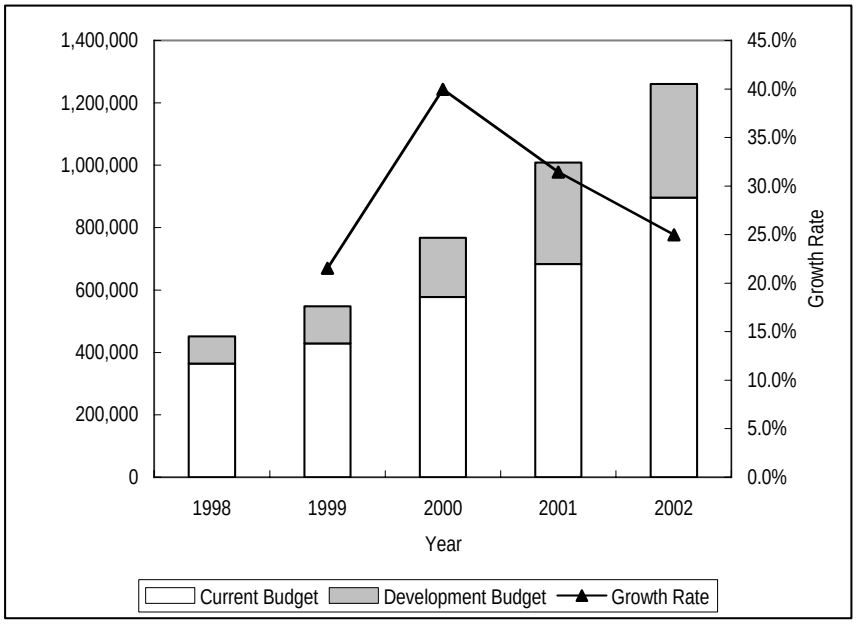
Table 2.13 Government Budget Composition

Item	Explanation
Government Total Budget	The composition of the governmental public budget as well as the budgets for banks, government corporations and government-affiliated enterprises
Government Public Budget	Financial resources required to carry out the annual programs and determines current and development credits for executive bodies
General Revenues	Revenues from oil and gas, taxes, and other incomes of the government public budget
Special Revenues	Revenues legally allotted to special expenditures in the public budget
Development Budgets	Credits provided for implementing development projects and expand current expenditures of the government's socio-economic plans
Current Budgets	Credits provided for meeting government current expenditures as well as expenditures for maintaining the level of he government's socio-economic plans

Source: *Iran Statistical Year Book, 2001*

(2) Provincial Budget

The provincial budget has been increasing rapidly though it speed is reducing. However, it not so high speed if the high inflation rate is considered. The growth rate shows the highest in 2000, which coincides with the recent highest inflation rate in 1999 showing 20.1% in the urban area and 27.6% in the rural area. The same phenomenon can be found in the household income data.



Source: Management and Planning Organization of Golestan

Fig. 2. 27 Provincial Budget

2.2.3 Socio-economic Frame Forecast

Flow of Socio-economic Frame Forecast

Socio-economic frame in the target year of 2025 is forecasted for the basis of the Master Plan of the Study. Socio-economic frame is comprised of (1) population, (2) income or GRDP, (3) industrial structure, (4) land use and (5) infrastructure development. Therefore, in order to make a forecast of socio-economic frame, it is necessary to make forecasts of all (1) to (3) factors. The national development plan and the regional development plan are the basis for such forecasts. The relation of each factor and flow of forecasting work is shown in Fig. 2.28.

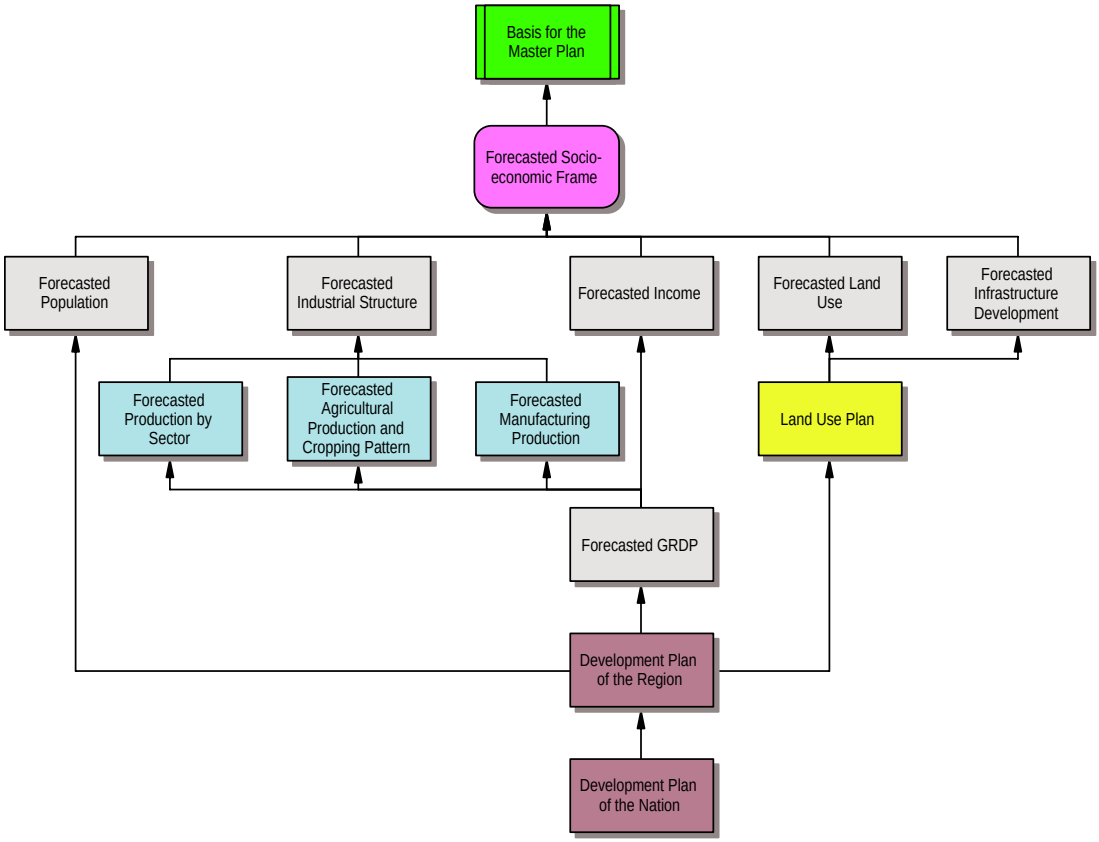


Fig. 2.28 Flow of Socio-economic Frame Forecast

Preliminary Setup for the Forecast of Socio-economic Frame

As a result of the socio-economic study, following factors are setup at the master plan stage of this Study.

Table 2.14 Preliminary Setup for the Socio-economic Frame Forecast

Factor	Preliminary Setup
GDP growth	In the short-term, GDP increases steadily as it is forecasted by the World Bank. It surely depends on the international oil price. In the middle term to the long-term, it is strongly affected by the results of the economic reform.
Regional population	The growth rate continuously decreases. The speed of decreasing depends on the urbanization and improvement of standard of living.
Regional income	The nominal income increases rapidly because of the high inflation in the short-term. The real income growth strongly depends on the result of economic management, which takes a long-time to realize. It should be noted that even nominal income increase changes the lifestyle of the household.
Land use	In the short-term, it depends on the economic activities especially agricultural production. However, this factor is strongly affected by zoning as well as regional development plan.
Industrial structure	In the long-term, it is sure that the share of primary sector decreases. However, the speed of change depends on the result of the economic reform and the national development plan, which allocates the industries to regions.
Infrastructure development	It depends on the governmental budget increase for capital formation.

(1) GDP Growth

According to the past actual trend of GDP, in other words the trend of GDP in 1997-constant price, it can be illustrated in the following figure.

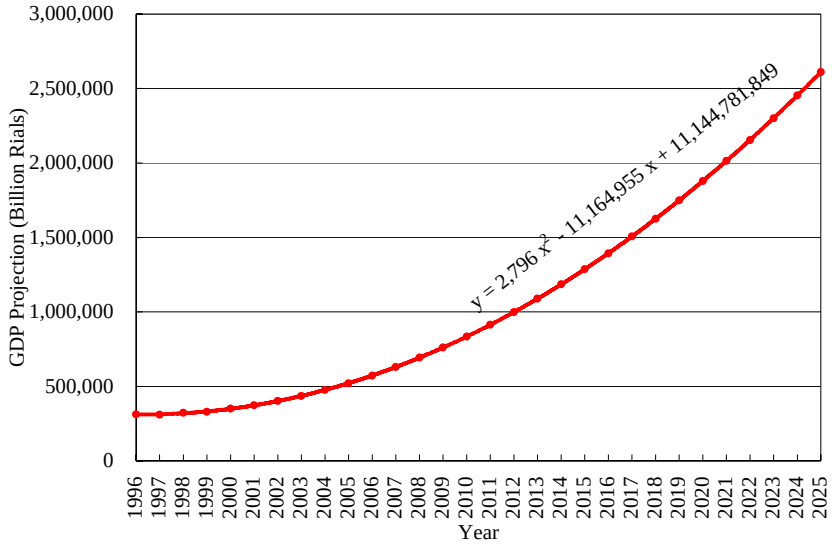


Fig. 2.29 GDP Projection Based on Actual Trend

Using a formula shown in the above figure, the GDP trend for the future can be projected as shown in the following table. It may be needed to apply a social economic situation as of the year 2025, the target year of the Project.

Table 2.15 GDP Projection Based on Actual Past Trend in 1997 Constant Price

(GDP in Total: Billion Rials)

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
GDP in Total	312,531	311,123	322,701	329,103	350,910	372,685	401,874	436,009	476,141	521,863
Growth Rate against Previous Year		-0.45%	3.72%	1.98%	6.63%	6.21%	7.83%	8.49%	9.20%	9.60%

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
GDP in Total	573,175	630,077	692,569	760,651	834,323	913,585	998,437	1,088,879	1,184,911	1,286,533
Growth Rate against Previous Year	9.83%	9.93%	9.92%	9.83%	9.69%	9.50%	9.29%	9.06%	8.82%	8.58%

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GDP in Total	1,393,745	1,506,547	1,624,939	1,748,921	1,878,493	2,013,655	2,154,407	2,300,749	2,452,681	2,610,203
Growth Rate against Previous Year	8.33%	8.09%	7.86%	7.63%	7.41%	7.20%	6.99%	6.79%	6.60%	6.42%

Sourse: Data from 1996 to 2002 is excerpted from the Iran Statistical Year bBook 1382.

According to the actual data reported in the statistics, the growth rate of GDP in 2002 against that in the previous year is 7.83 % as indicated above. On the other hand, the annual average growth rates, which were forecasted by the World Bank, are 7.4 % in 2002, 6.6 % in 2003 and 5.7 % from 2003 to 2007 as indicated in the Table 1.3 in Chapter 1. The growth rate, 7.4 % in 2002 forecasted by the World Bank that is lower than the actual one may be on account of temporary data applied.

Anyway, the annual average growth rate of GDP based on the actual past trend shown in the above table is resulted at 8.43 % since 2003 till 2025. It seems rather optimistic comparing with the World Bank forecast. Accordingly, the other forecast is made based on the World Bank forecast as shown in the following figure.

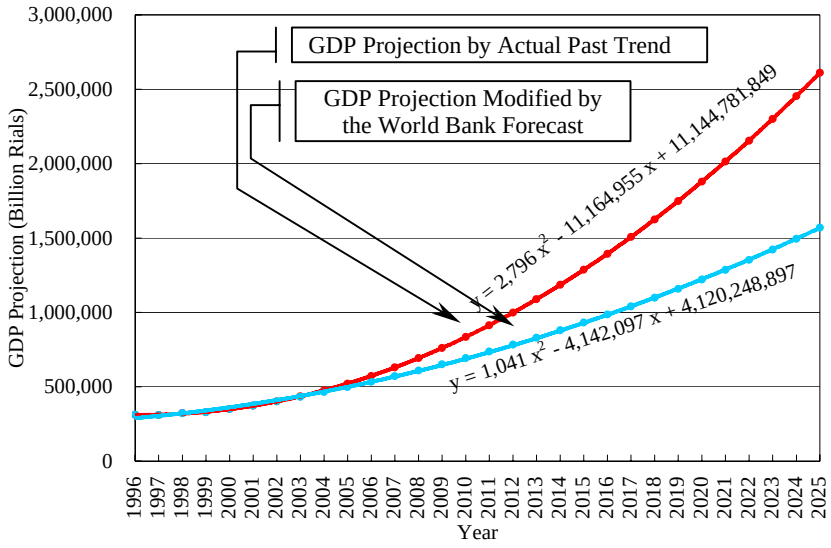


Fig. 2.30 GDP Projection Based on Actual Trend Modified by the World Bank Forecast

Using the formula showing in the above figure of GDP projection modified by the World Bank Forecast, the other annual amount of GDP can be estimated for the future as shown in the following table.

Table 2.16 GDP Projection Based on Actual Past Trend Modified by World Bank Forecast in 1997 Constant Price

(GDP in Total: Billion Rials)

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
GDP in Total	312,531	311,123	322,701	329,103	350,910	372,685	401,874	432,587	464,861	498,726
Growth Rate against Previous Year		-0.45%	3.72%	1.98%	6.63%	6.21%	7.83%	7.64%	7.46%	7.29%

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
GDP in Total	534,211	571,348	610,164	650,691	692,962	737,010	782,872	830,587	880,197	931,751
Growth Rate against Previous Year	7.12%	6.95%	6.79%	6.64%	6.50%	6.36%	6.22%	6.09%	5.97%	5.86%

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GDP in Total	985,300	1,040,903	1,098,625	1,158,537	1,220,720	1,285,264	1,352,269	1,421,848	1,494,125	1,569,237
Growth Rate against Previous Year	5.75%	5.64%	5.55%	5.45%	5.37%	5.29%	5.21%	5.15%	5.08%	5.03%

Sourse: Data from 1996 to 2002 is excerpted from the Iran Statistical Year bBook 1382.

According to this projection, the annual average growth rate of GDP based on the actual past trend modified by the World Bank Forecast shown in the above Table is resulted at 6.10 % since 2003 till 2025. It seems rather likely one than 8.43 % mentioned above. Anyway, it may say that the GDP in Iran will be grown constantly unless unexpected political, economical and financial crises will happen.

(2) Population

Present Population

Total present population (2005) of the study area is 93,141, of which 46,882 (50.3 %) live in flood-prone area, and 46,259 (49.7 %) live in the other areas. Flood-prone area encompass villages which are usually affected by flood/debris flow in one way or another, and were thoroughly covered by JICA Survey for Environmental and Social Considerations conducted during October 2004 to June 2005. Other areas include Kalaleh city, police/military installations and associated housing facilities, livestock pens with associated persons, and the village with no inhabitants. Flood prone area includes 44 villages distributed in Golestan, Khorasan and Semnan provinces. Total number for city, villages and housing/pen sites in the other areas is 22, mostly being in Golestan province, at lower reaches of the basin. JICA study team concentrates on flood-prone area, and draw plans/program for protecting these villages against flood/debris flow. Therefore data/information on these villages are provided herein below in details.

Table 2.17 Population Status in Flood-Prone Area of the Madarsoo River Basin

Total Number in 2005						
Village	Household	Population	Male	Female	Child <9	Average Household Size
44	8,963	46,882	22,328	24,264	8,154	6.5

Source: JICA Study Team, Survey for Environmental and Social Considerations- October 2004 – June 2005.

Future Population

Since the target year of the plan formulated by JICA study team is 2025, population for target year is estimated with 5-year interval, to provide ground for design and

establishment of infrastructures/institutions to meet future demand of the area. In estimating future population, following relation has been applied:

$Fp = Pp \times (1+pgr)^n$

Where *Fp* is future population; *Pp* present population; *1* is constant number; *pgr* is average annual population growth rate in %, and *n* is year's interval.

Here population is estimated for the next 20 years with 5-year interval, so $n = 5$, and average annual growth rate is set at 1.80%, assuming all factors on population growth remain constant.

Bases/reference for applying the figure 1.80% growth rate in this formula:

- Average of long-term of annual population growth rate in Golestan province is 1.72% (2.30% in urban area and 1.14% in rural area). Since the study area is comprised of urban and rural areas and largely occurs in Golestan, figure 1.72% can be used for estimating its future population.
- Result of statistical analysis performed by Iranian consultants working for Ministry of Jihad-e-Agriculture in the Madarsoo River basin, indicates that growth rate of 1.80% is reasonable in predicting population of this area. They have applied the same figure in their calculations.
- Average annual growth rate of population for the country (on long-term basis) is 1.80%, with decreasing trend.

It should be noted that with introduction/encouragement of family planning schemes by the Iranian government, and prevalence of old motto "less child, better life", population growth rate would keep its constant trend, or even show decreasing tendency in future. Therefore data on population growth presented in this report can be reliably used in development plans.

Table 2.18 Present and Future Population in the Madarsoo River Basin

Area	Present	Future			
	2005	2010	2015	2020	2025
Flood Prone	46,882	51,256	56,038	61,266	66,982
Others	46,259	50,575	55,294	60,453	66,093
Overall	93,141	101,831	111,332	121,719	133,075
Population Density (Persons/ha)	0.39	0.43	0.47	0.51	0.56

Total area (flood prone + others) is 236,400 ha, and kept constant.
Sources: JICA Study Team, Survey for Environmental and Social Considerations, October 2004 –June 2005.
Statistical Yearbook of Golestan Province, Management and Planning Organization of Golestan- 2003

(3) Regional Income

The targeted area of the Project includes two provinces of the Golestan and Khorasan Provinces. Therefore, the regional incomes for both the provinces are to be made clear. Following table shows them based on the statistics as indicated in its footnote.

Table 2.19 Gross Regional Income of the Golestan and Khorasan Provinces

(Billion Rials)

Description	Province	Golestan		Khorasan	
	Christian Year	2000	2001	2000	2001
	Iranian Year	1379	1380	1379	1380
Agriculture, hunting, forestry		2,747	2,878	6,786	7,771
Fishing		173	190	3	5
Mining		30	43	265	325
Manufacturing		558	506	5,764	6,006
Water, electricity and gas		73	74	937	936
Construction		471	462	2,719	2,476
Wholesale & retail trade; repair of motor vehicles and personal and household goods		2,030	2,241	7,780	9,331
Hotel and restaurants		52	57	660	826
Transport, storage and communications		466	1,057	3,261	4,120
Financial intermediate		107	134	542	675
Real estate, renting and business activities		799	867	4,642	5,618
Public administration, defence and social security		643	793	2,558	3,180
Education		473	566	2,120	2,819
Health and social work		288	348	1,456	1,889
Other community, social and personal activities		71	128	564	633
Total		8,981	10,343	40,057	46,609
Taxes on imports		89	122	456	643
Gross Regional Domestic Product (Gross Regional Income) (at market prices)		9,070	10,465	40,513	47,252
Population		1,543,860	1,574,737	6,481,635	6,611,268
Average Per Capita Regional Income (1,000 Rials/capita)		5,875	6,646	6,250	7,147

Source: Iran Statistical Year Book 1381 and 1382, Statistical Centre of Iran, Department of Publication and Information, Islamic Republic of Iran.

(Note) Population in each year above are roughly estimated based on the average annual growth rate of 2% since 1996 census..

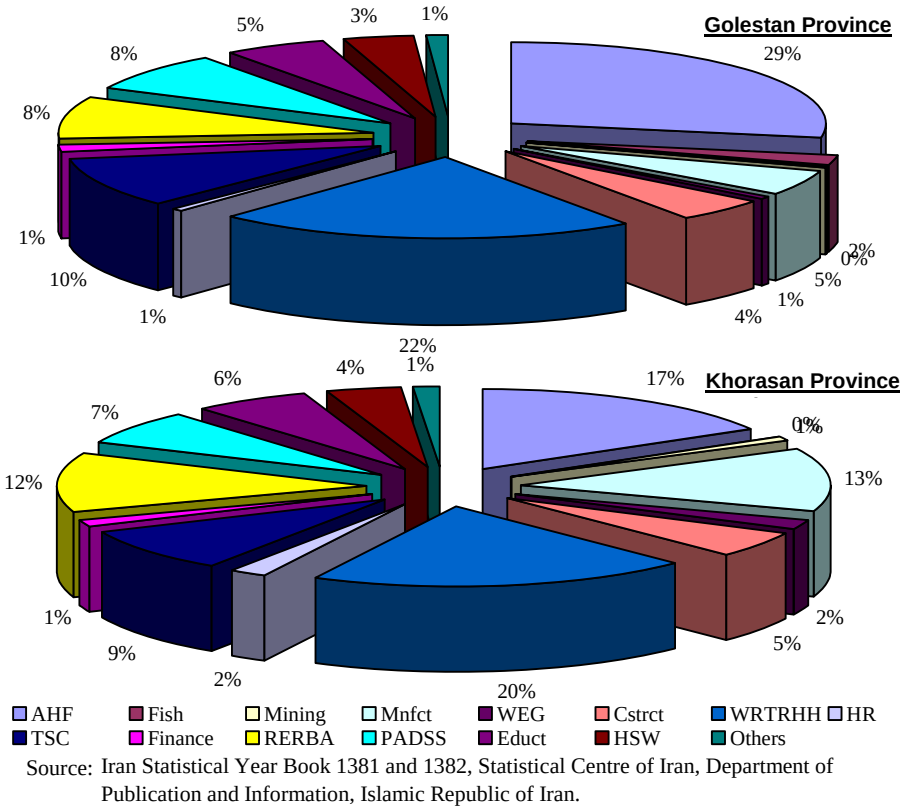
Because that the Golestan Province was newly established dividing the Mazandaran Province into two in 1997, the financial scale of the Golestan Province is still smaller than that of Khorasan Province.

It may not be sure to say something for the future status from only two years data. From the viewpoint of the financial scale of the Golestan Province, it may say to increase the regional income constantly. But it should be noted the annual inflation rate has been also rather high level as 13.8 % in the urban area and 25.6 % in rural area in the same province as discussed in sub-clause 2.2.2.

The average Per-Capita Regional Income in Khorasan Province is rather higher as 7.1 million Rials than that in Golestan Province as 6.6 million Rials as of 2001 reflecting their economic activities.

(4) Industrial Structure

Following figures show an industrial structure as of 2001 in both the Golestan and Khorasan Provinces based on the Table 2.17.



Source: Iran Statistical Year Book 1381 and 1382, Statistical Centre of Iran, Department of Publication and Information, Islamic Republic of Iran.

Fig. 2.31 Industrial Structures in Golestan and Khorasan Provinces

As shown in the above figures, the sectors of Agriculture, Hunting and Fishery (AHF) and Wholesale & Retail Trade, Repair of Motor Vehicles, and Personal & Household Goods (WRTRHH) share with high rates both the Golestan and Khorasan Provinces.

Between the two of AHF and WRTRHH, AHF sector shares higher as 29 % than WRTRHH sector as 22 % in Golestan Province, while those in Khorasan Province have been reversed as 17 % and 20 % respectively, reflecting their economic activities.

From the viewpoint of location of the provinces, it may say that this structural pattern of their industries will be the same for the future too.

(5) Infrastructural Development

Usually, the investment for the infrastructural development belongs to the budget of development expenditure. Following table shows the current expenditure and the development expenditure of the whole nation of Iran and targeted two provinces of Golestan and Khorasan.

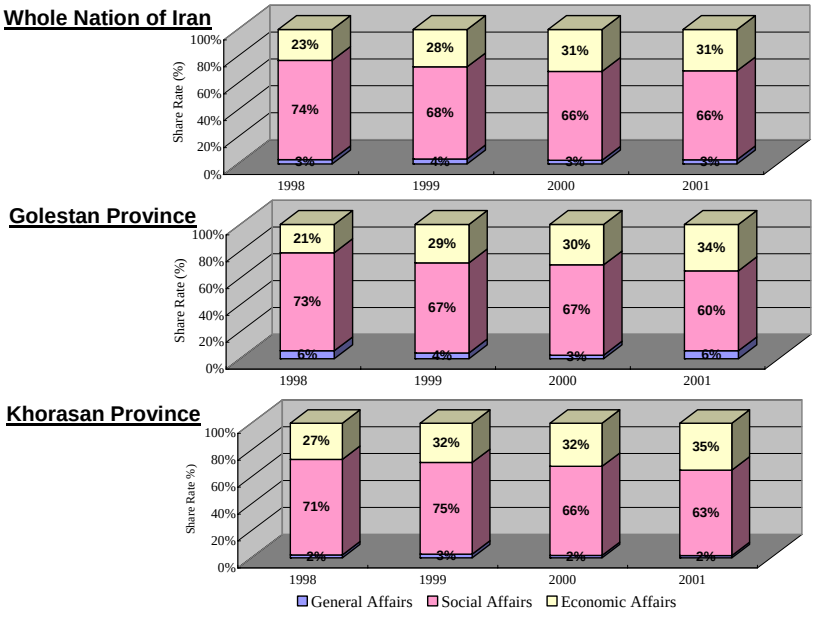
Table 2.10 Current and Development Expenditures of Iran and Targeted Provinces

(Million Rials)

Year in Christian Calendar	1998	1999	2000	2001	2002
Year in Iranian Calendar	1377	1378	1379	1380	1381
Total in the Nation					
Current Expenditure	15,011,211	17,850,738	22,825,747	29,671,043	38,777,189
Development Expenditur	4,111,403	4,680,555	4,024,750	9,752,292	9,836,918
General Affairs	132,127	176,912	109,649	309,132	363,294
Social Affairs	3,034,982	3,202,932	2,659,609	6,438,275	5,934,298
Economic Affairs	944,294	1,300,711	1,255,492	3,004,885	3,539,326
Total Expenditure	19,122,614	22,531,293	26,850,497	39,423,335	48,614,107
Golestan Province					
Current Expenditure	363,064	432,910	574,128	803,761	996,221
Development Expenditur	86,970	118,649	93,733	336,439	n.a
General Affairs	5,098	5,086	2,480	19,624	n.a
Social Affairs	63,556	79,617	63,059	200,770	n.a
Economic Affairs	18,316	33,946	28,194	116,045	n.a
Total Expenditure	450,034	551,559	667,861	1,140,200	n.a
Khorasan Province					
Current Expenditure	1,551,816	1,846,956	2,351,828	2,931,108	3,851,365
Development Expenditur	357,534	393,102	324,182	814,354	n.a
General Affairs	7,761	11,559	5,700	13,800	n.a
Social Affairs	253,797	267,078	214,682	516,836	n.a
Economic Affairs	95,976	114,465	103,800	283,718	n.a
Total Expenditure	1,909,350	2,240,058	2,676,010	3,745,462	n.a

Sourse: Iran Statistical Year Book 1382, Statistical Centre of Iran, Management & Planning Organization, Islamic Republic of Iran.

Among the development expenditures, the expenditures for social affaires include those for the urban and rural development, and the expenditures for economic affairs include those for road and transportation. Following figures show their share trend from the year 1998 to 2001 of development expenditures.

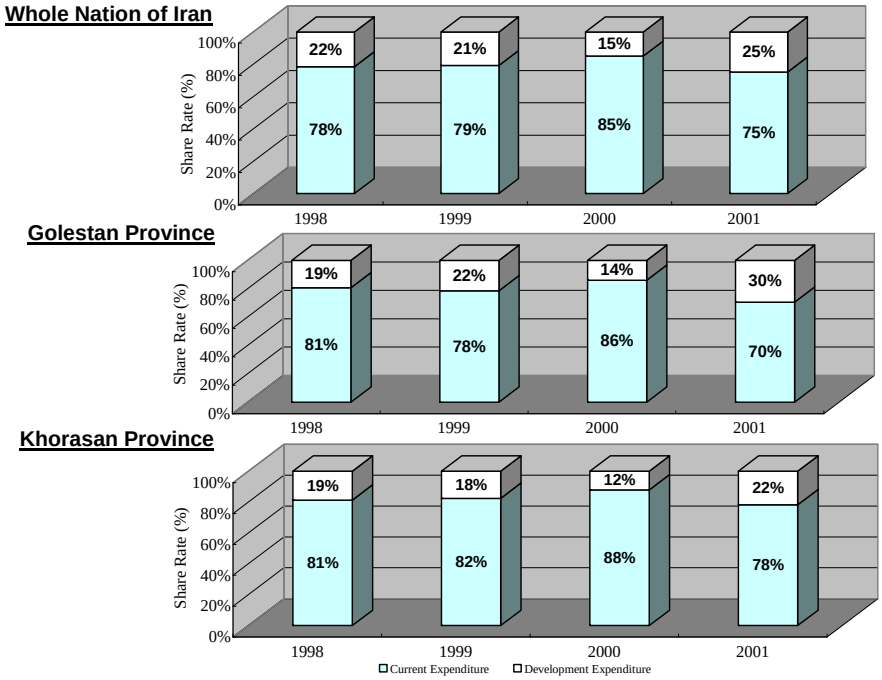


Source: Iran Statistical Year Book 1381 and 1382, Statistical Centre of Iran, Department of Publication and Information, Islamic Republic of Iran.

Fig. 2.32 Share Trend of Development Expenditures

From the viewpoint of their share rate above, the expenditures for social infrastructures have been paid out with limitation. However, the share rate of the development expenditures are fluctuated ranging from 12 % in the Khorasan Province

to 30 % in the Golestan Province against the total expenditures during the same period as shown in the following figures.



Source: Iran Statistical Year Book 1381 and 1382, Statistical Centre of Iran, Department of Publication and Information, Islamic Republic of Iran.

Fig. 2.33 Share Trend of Each Expenditures to the Total Expenditures

Usually, almost of farmers in rural areas sell their agricultural products to wholesalers. In the case of Iran, certain farm gate prices having set by the Government are applied for some of major products like wheat and so on as a minimum standard for protecting the farmers' life. But, such Government-set farm gate prices do not reflect the actual market status like demand-supply mechanism.

Furthermore, the agricultural business is right now becoming quite difficult because of high inflation rate. The farmers should buy such investment materials as fertilizers, seeds, nurseries and others that are expensive reflecting the inflation. However, the Government-set farm gate prices are usually fixed, or only being slightly changed even they are revised. It means that the farm gate prices seem not to recover the farmers' investment cost.

If more development expenditures will be invested to road and transportation networks and to rural development for making easy to approach their market, and will give some subsidies to establish a kind of self-supporting systems to enhance farmers' intensity, it can be expected that the farmers will sell their products in the market directly with market prices. This will contribute to increase farmers' purchasing capability as one of their economic activities. In another way, if farmers have enough circumstances, they will develop their own processing factories for example in a field of some of dairy industries. This will contribute to enhance the rural economic activities.

From the viewpoint of the above, it may be required that the constant development expenditures with high level under a practicable rural development program led by the Government first.