Post Disaster Needs Assessment (PDNA)

Iran 2019 Floods in Lorestan, Khuzestan and Golestan Provinces

October 2019

IRAN, FLOODS 2019

POST DISASTER NEEDS ASSESSMENT REPORT

FINAL REPORT

OCTOBER 2019

Foreword

The flooding disaster events of March 2019 in the Islamic Republic of Iran have had significant consequences in terms of damage and loss. Twenty-five of the country's 31 provinces were flooded; more than 78 people died, particularly during the flash floods period; ten million persons were affected; and 500,000 displaced half of them were children. The Government of the Islamic Republic of Iran responded to the floods swiftly and the emergency phase of the response was completed successfully, including search and rescue operations and delivery of relief aid. The Government also welcomed support from international development partners and the United Nations in the national response effort.

To assess the full extent of the disaster's impact, define the needs for and design of a recovery strategy, the Government led a post-disaster needs assessment (PDNA) for three pilot provinces, facilitated by the United Nations in Iran. A multidisciplinary team of Government experts were engaged, led by the Plan and Budget Organization– with participation of all line ministries and provincial and local governments, and technical support from the United Nations.

The PDNA exercise was a first pilot step toward developing wholistic recovery and development program that promote sustainability, equity and efficiency in DRM frameworks. Using internationally accepted methodology to measure the effects of disaster and to produce an assessment of its direct, indirect and secondary damage and loss impact, the derived estimates are based also on information collected from field surveys, and complemented by information provided by ministries, provincial and district level governments. The PDNA report provides baseline data, describes the damages and losses to human, infrastructural and natural assets across multi-sector economic activities, and also the impact the disaster has had on the provincial economies. It is also a useful planning instrument for recovery and development purposes.

The challenge now is to ensure recovery processes introduce resilience measures to mitigate impact from future disaster, identify a disaster recovery framework for building back better and to keep Iran on track to fulfill its national growth and development goals.

We would like to express our sincere appreciation to all partners who have assisted the PDNA process and helped in preparing this report, and especially the Plan and Budget Organization and the United Nations in Iran.

Acknowledgements

The Post Disaster Needs Assessment (PDNA) for the 2019 Iran floods would not have been possible without the collaborative efforts of the Government of Islamic Republic of Iran and the United Nations. The process was implemented with the commitment, cooperation and expertise of various ministries, agencies, governmental organization and departments.
The Government of Islamic Republic of Iran would like to extend special acknowledgments to the following authorities:

Plan and Budget Organization, Vice-President office for Women and Family Affairs, Deputy Director of Rural Development and Deprived Areas, Ministry of Industry, Mine and Trade; National Iranian Gas Company, Ministry of Roads & Urban Development, Ministry of Cooperatives, Labor, and Social Welfare, State welfare organization of Iran, Ministry of Agriculture Jihad, Ministry of Health and Medical Education, Ministry of Energy, Cultural Heritage, Handicrafts and Tourism Organization of Iran; Forests, Rangeland and Watershed Management Organization, Iran National Cartographic Center, National Disaster Management Organization Of Iran, Department of Environment, Iranian Space Agency, Organization for Development, Renovation and Equipping Schools of I.R. Iran; Road, Housing and Development Research Center, Islamic Revolution Housing Foundation, Iranian Red Crescent Society

The Government of Islamic Republic of Iran also appreciates the technical input and support from the following United Nations agencies:
The United Nations Residence Coordination Office (UNRC), United Nations Development Program (UNDP), The Food and Agriculture Organization of the United Nations (FAO), The United Nations Educational, Scientific and Cultural Organization (UNESCO), United Nations Population Fund (UNFPA), United Nations International Children's Emergency Fund (UNICEF), United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), World Health Organization (WHO), United Nations Office for the Coordination of Humanitarian Affairs (OCHA)

And, also The Government of Islamic Republic of Iran express their appreciation to PDNA team members, National and International Consultants and all the contributors who supported the process including Disaster Risk Reduction and Recovery Team of the Crisis Bureau (UNDP), International Institute of Earthquake Engineering and Seismology (IIEES) and Plan and Budget Organization of Iran including bureau of Technical and Executive affairs, Consultants and Contractors and other bureaus.

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Executive Summary

Background

Iran has a high level of exposure to multiple disaster risks. Situated in one of the most arid regions of the world, it suffers from frequent droughts, desertification, wildland fires, heat waves, sand or dust storms.[1] Moreover, floods, debris and mud flows; thunderstorms, hailstorms, wind storms, blizzards, snow avalanches, and other severe storms, forest fires and sand and dust storms increasingly affect different parts of the country. Due to its particular location in the Alpine-Himalayan mountain system, Iran is highly vulnerable to numerous and often severe earthquakes along with landslides, rockslides, rock falls, liquefaction, submarine slides, and subsidence.

The widespread floods and landslides across Iran in the spring of 2019 due to unprecedented rainfall within a brief duration was a reminder of its high level of vulnerability to climate change impacts. From mid-March, Iran experienced three major waves of rain and floods within a two-week period in what has since been described as a 1-in-100 year event. The extensive damage caused by the floods and landslides warranted a joint effort from all governmental and non-governmental actors to provide relief to those affected and to begin planning for recovery based on an accurate and systematic assessment of the needs.

Immediately after the floods and landslides of April 2019, the Plan and Budget Organization (PBO) of the Government of Iran commissioned the United Nations (UN) system to conduct a Post Disaster Needs Assessment (PDNA) of the impact of the floods and landslides in three selected provinces of Golestan, Lorestan and Khuzestan. The assessment was led by the Government of Iran over a period of six weeks starting from 2nd July to 9th August, 2019. A team of multi-sectoral experts from the UN agencies and national experts conducted the assessment with representatives from relevant line ministries and estimated the damage, loss and recovery needs across 13 sectors, including social sectors, productive sectors, infrastructure sectors and cross-cutting sectors such as Environment, Employment and Livelihoods, Disaster Risk Reduction, and Gender and Social Inclusion. The assessment has also analyzed the economic impact of the disaster on the affected provinces.

The findings of the PDNA captured in this Report present a consolidated view of damage, loss and recovery needs estimates, based on information received from various line departments and the expertise of a multi-institutional and interdisciplinary assessment team. In addition, for each sector, strategies that would allow for resilient recovery are also provided. The PDNA Report provides a broad recovery strategy to contribute to the three pillars of government's vision of a "Resilient Economy", "Progress in science and technology" and "Promotion of cultural excellence".[2]

The PDNA as a process has been used in Iran for the first time and the report has generated a lot of information that is useful not just for the current post-flood recovery but to build resilience against future disasters. The recommendations are made to strengthen the disaster risk management system (from preparedness to response and recovery) as well as to promote risk-informed development.

The remaining sections of this executive summary provide a brief overview of the disaster event, government and humanitarian response to the disaster, the PDNA process and methodology, cumulative effects and impacts of the disaster, brief summary of recovery needs for each of the 13 sectors, economic impact of the disaster and a suggested recovery strategy.

Disaster Event

Starting in mid-March, Iran experienced three major waves of rain and floods within a two-week period in what has since been described as a 1-in-100 year event. Record rainfalls occurred with some areas receiving 70% of their annual rainfall in a single day. According to Government officials, 140 rivers burst their banks, leading to flash floods which affected 25 of the 31 provinces. It left entire villages with no shelters; people who lost access to clean drinking water and could not maintain their usual standards of personal hygiene ; families who lost their livelihoods and whose children are unable to attend school. Due to the destruction of public infrastructure, these communities have no access to healthcare facilities

1. Country Report: The Islamic Republic of Iran On Disaster Risk Management: Ali Bakhtiari; 2014; https://www.adrc.asia/countryreport/IRN/2013/IRN_CR2013B.pdf
2. 6th Five-year Development Plan

which have been totally or partially destroyed. There were not enough facilities for the 270,000 who have been provided with temporary shelters in public spaces such as undamaged schools, mosques or public centers.[1]

The destruction of infrastructure, private and public properties is extensive and widespread. More than 10 million people have been affected, including one million refugees and other foreigners. Nationwide, at least 78 people have lost their lives and about 1,140 people have been injured, according to authorities. It is estimated that about 365,000 people have been displaced because of the flooding. By mid-April, an estimated 2 million people needed humanitarian assistance; about 500,000 of which were women of reproductive age with specific health needs, including an estimated 7,125 women who were pregnant at that point.

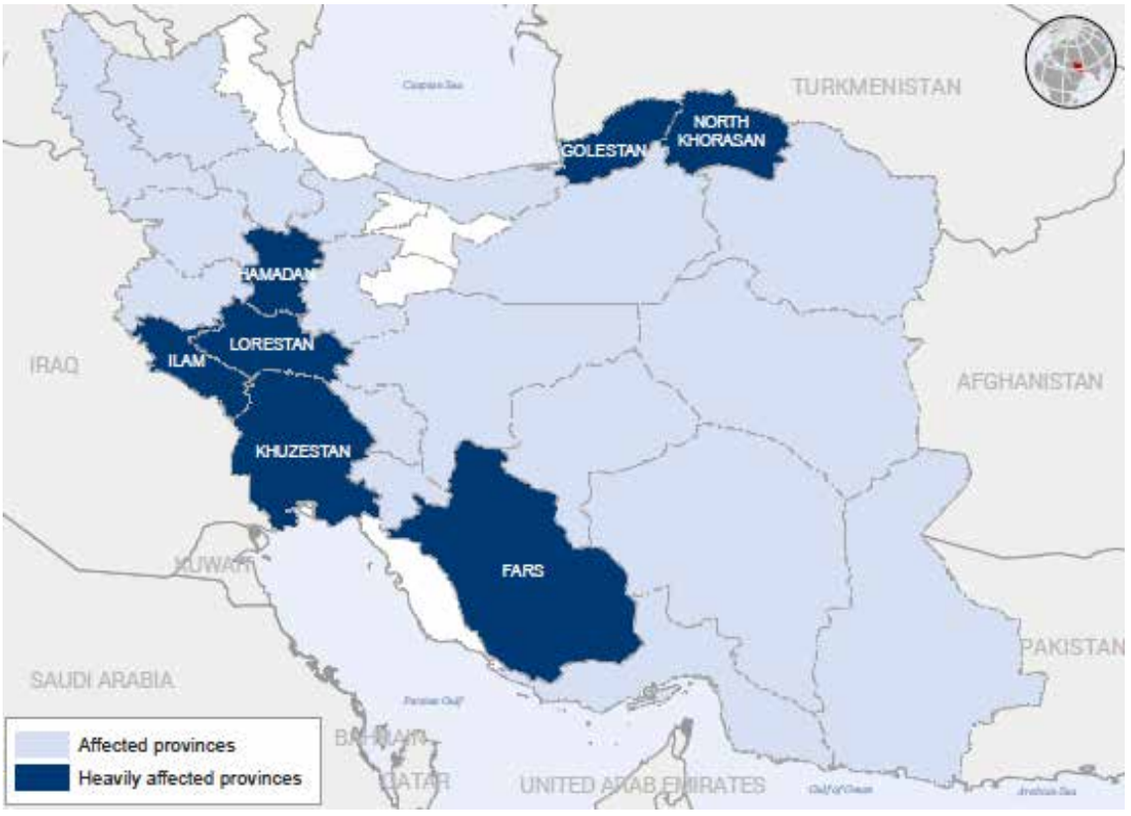

Figure 1: Map of flood-affected provinces of Iran, Source: UNOCHA, I.R. Iran Flood Response Plan, April 2019

By province, the following table shows the number of people affected by the floods and landslides.

Table 1: Population affected by the floods and landslides

Province	Population affected	Villages Affected (Nos.)	Human Casualty
Golestan	300,000[2]	500	8
Lorestan	1,100,000[3]	1800	15
Khuzestan	400,000	300	6
TOTAL	**1,800,000**	**2600**	**29**

Source: UNOCHA

1. Source: Norwegian Refugee Council; IRAN FlOODS: RAPID NEEDS ASSESSMENT APRIL 2019 in GOLESTAN, KERMANSHAH, LORESTAN AND KHUZESTAN PROVINCE
2. The number was estimated by using the population of the flood-affected areas, which makes it a rough estimation.
3. The flood affected 1,800 villages (i.e. about 68% of total villages) in Lorestan province. Considering that villages are more flood-prone than cities, we could reach to a rough estimation of 1.1 million flood affected people in Lorestan.

Golestan

Flash floods began on 19th March in Golestan province, north east of the country, resulting in the evacuation and displacement of thousands of individuals. Agricultural lands and livelihood assets were destroyed, in addition to damage to public infrastructure (power supply, roads, schools and health centers). Electricity supply was disrupted, and to a lesser degree, in some locations water has become unsuitable for drinking and other uses. Aq Qala and Gomishan areas, downstream from Gonbad settlement, have been severely affected. The floods lasted longer, that by 10th April, several villages and a significant section of Gomishan City were still under water. There are about 30,000 Afghan refugees living in Golestan province, 3,000 of whom are undocumented. Many of them were affected and displaced but received first-line emergency assistance.

Lorestan

In Lorestan province, the majority of cities and districts of the province were affected by the rainfall like Mamulan, Dorud, Khoramabad, Poldokhtar and Wisiyan. The flow rate of the Khoram Abad River increased from 400 cubic meters per second to 700, while the Tireh River in Dorud experienced a flow rate which increased from 380 cubic meter to 550 cubic meters per second. Although the number of casualties was mitigated through warnings and evacuation of rural and urban areas, the aftermath included 15 fatalities and 256 injuries. Nonetheless, the scale of financial loss is vast and significant as many people had to leave their houses and all their belongings behind.[1] In the same province, 7 percent of all businesses, that is to say 3,260 businesses, have been damaged, of which 70 percent were located in Pol-e Dokhtar city. Aside from financial damage in Lorestan, over 46,000 families have been directly affected by the flood.

Khuzestan

Due to heavy rainfall in Zagros Mountains, Dez River and Karkheh River overflowed and water accumulated in Dez Dam and Karkheh Dam with Karkhe dam's reservoir located in Khuzestan province, reaching 8,400m³/sec. As dams reached their maximum capacity, the Ministry of Energy managed to release water. In order to prevent disaster occurrence, the Karkheh Dam, which was near its capacity limit, was opened to discharge excessive water. During the second week of April, about 200 villages had been evacuated, with 46,000 people displaced that started living in emergency shelters. In Ahvaz, 110 patients were evacuated from a hospital for mentally ill patients on 8th April, according to a government news agency. In total, 6 cities and 210 villages were inundated.[2] Oil output had been reduced in the oil-rich province of Khuzestan, home to the Azadegan and Yadavaran oilfields. Around a dozen oil wells have been shut down because of massive floods, leading to a drop of up 15,000 to 20,000 barrels per day in crude production.[3]

Overall, the flood damage in Golestan, Khuzestan, Mazandaran, and Lorestan provinces has been more than all the other provinces and constitutes 76 percent of all the flood damage.[4]

Government and Humanitarian Response[5]

The Government-led response, primarily through Iranian Red Crescent Society (IRCS) and local communities, provided assistance to affected people. For the early recovery of the affected families, the Government allocated small cash grants and free-of-charge living facilities to the most affected families.

In Golestan, Government has allocated IRR 4,600 billion (USD 41 million) for housing aid. To date, 1,926 applicants have received housing grants totaling IRR 71 billion (USD 624,000). The amount is soon expected to reach IRR 100 billion (USD 891,000). Construction of 20,000 housing units has begun in Aq-Qala. Also, farmers have received grants worth IRR 140 billion (USD

1. Source: Norwegian Refugee Council; IRAN FlOODS: RAPID NEEDS ASSESSMENT APRIL 2019 in GOLESTAN, KERMANSHAH, LORESTAN AND KHUZESTAN PROVINCE
2. https://www.presstv.com/Detail/2019/04/12/593234/Iran-flood-oil-khuzestan-zanganeh-output; https://en.wikipedia.org/wiki/2019_Iran_floods#Khuzestan
3. https://www.reuters.com/article/us-iran-oil-floods/iran-closes-oil-wells-in-flood-hit-khuzestan-province-output-drops-idUSKCN1RT0YT
4. https://iranintl.com/en/iran/flood-damage-iran-initial-report
5. Source: UN OCHA FlASH UPDATE IRAN dated 15 MAY 2019

1,200,000). The Ministry of Education has distributed 52 prefab units for temporary schools and assigned IRR 50 billion (USD 445,780) for the renovation of heating systems of schools which are affected by the floods.

In Lorestan, the Governor initiated unemployment insurance for the people who lost their jobs after the floods in this province. The Governorate's office also employed more than 4,000 people from the affected families for approximately four months for the reconstruction of the damaged houses. Flood affected households have received grants IRR 160 billion (USD 1.4 million). Four thousand five hundred applications were referred to the banks for additional housing grants, of which 1,100 cases have been approved. As a support from neighboring provinces, Isfahan Housing Foundation will reconstruct 4,250 housing units in Pol-e Dokhtar. Ardabil Housing foundation will reconstruct 1,100 housing units in Lorestan. Also the IRGC will cooperate in the reconstruction process of 250 housing units. The Ministry of Education (MOE) has distributed 100 prefabricated structures for temporary schools and has assigned IRR 50 billion (USD 445,780) for the renovation of heating systems of schools which are affected by the floods. Government has distributed 24,000 educational books in the province. Khuzestan has been allocated an agricultural grant of IRR 9,260 billion (USD 82 million) of which half has already been paid according to government sources.[1]

In terms of population affected, the provinces of Lorestan, Golestan, Khuzestan and Ilam are considered the most severely affected. The UN response plan targeted the 115,000 most vulnerable people for the provision of humanitarian assistance as well as support in early recovery. The total humanitarian response plan is USD 25 million. Those targeted in the response plan are the displaced population within the four provinces, of which 33,325 are in Lorestan, 14,589 in Golestan, 61,000 in Khuzestan, and 6,727 in Ilam.

In the four provinces of Mazandaran, Golestan, Khuzestan and Lorestan, the households and commercial units were exempted from Gas bills for 30-45 days. A quota of 5% has been assigned to the flood affected students competing for bachelors and master degrees' university entrance exams. Also university students can apply for loans.

Within the WASH sector, Relief International and NRC reported that assistance included the distribution of 1,200 hygiene kits in 28 villages of Lorestan, 117 dignity kits in four villages, 227 hygiene kits for children and 500 hygiene kits in Hirmand County in Sistan and Baluchistan province. A total of 2,750 people were reached through WASH assistance in the provinces of Golestan, Kermanshah and Baluchistan. Among the planned interventions within the sector is the provision of four sludge pumps in Khuzestan and Golestan. Within the shelter/ Non-Food Items sector, NRC will distribute 2,600 kitchen-sets and 2,500 other non-food items starting third week of May 2019 to the province of Lorestan. This is in addition to 2,300 cash cards (IRR 15 million each) planned for June in Lorestan.

The Child Protection Sub-sector supported IRCS in training on case management in Pol-e Dokhtat, in Lorestan, targeting members of IRCS Psychosocial Support teams. The objective of this training was to equip participants with skills to identify the most vulnerable people in affected communities, and ensure timely and effective referral. Subsequent to the training, the planned intervention was launched in Pol-e Dokhtat. In addition, UNICEF conducted initial discussions with the MOE for provision of school-based psychosocial support in flood affected areas.

Aside from the government and UN agencies, as of the 14th June 2019, Red Cross and Red Crescent Societies, international humanitarian organizations and private donors within and outside the country provided assistance through in-kind and cash donations. The donors include the following: The International Federation of Red Cross and Red Crescent Societies (IFRC); Ministry of Emergency Situations of Armenia; the governments of Russia; Azerbaijan; India; Japan through JICA; the Malaysian Consultative Council of Islamic Organizations; China; Pakistan; Oman; Georgia; Germany through the German Red Cross; Slovakia; UK, Italy, Austria, France, Kuwait; and Switzerland among others.[2]

1. Source: UN OCHA FlASH UPDATE IRAN dated 01 JUNE 2019
2. https://reliefweb.int/report/iran-islamic-republic/int-l-contributions-iranians-flood-hit-people-glance

Post Disaster Needs Assessment (PDNA)

Following the floods and landslides of April 2019, the Plan and Budget Organization (PBO), Government of Iran commissioned the United Nations (UN) system to conduct a Post Disaster Needs Assessment (PDNA) of the impact of the floods and landslides in three selected provinces of Golestan, Lorestan and Khuzestan. The assessment was led by Government of Iran over a period of six weeks starting from 2nd July to 9th August, 2019. A team of multi-sectoral experts from the UN agencies and national experts conducted the assessment with representatives from relevant line ministries and estimated the damage, loss and recovery needs across 12 sectors.

The assessment included Social Sectors such as Housing, Education, Culture and Tourism; Agriculture, Fisheries and Livestock for the Productive Sector; Infrastructure Sectors such as Energy, Transport, Water and Sanitation and Community Infrastructure; and Cross-Cutting Sectors such as Disaster Risk Reduction, Environment, Employment and Livelihoods, and Gender and Social Inclusion. The report presents a consolidated view, based on field surveys and information received from various line departments and the expertise of a multi-institutional and interdisciplinary assessment team.

Assessment Process and Methodology

The report follows the global methodology for PDNA as practiced by the World Bank, the European Union and the United Nations. The methodology is widely used by governments to assess disaster damage, loss and recovery needs. The assessment in Iran started with a two-day orientation of the line ministries and UN agencies to receive an overview of the methodology and adapt the data templates for the assessment to the local context. About 200 government representatives from the affected provinces and line ministries attended the orientation sessions. The following three weeks were allotted to data collection and estimating damage and loss for each sector by province. A second workshop was organized with the line ministries and UN agencies for the various sectors to draft reports and check data gaps and address cross-sectoral issues. The workshop also provided the platform to discuss the way forward for the recovery and lessons for conducting future assessments.

A first draft of the PDNA report was shared with the Plan and Budget Organization on 15th August 2019. Following further review, a revised Pre-Final Draft of the report was presented to the officials from PBO and NDMO on 2nd September 2019 and the document was shared via email on 3rd September 2019 for review in two weeks. Based on the comments received from the Government, a revised final report for endorsement of the line ministries and the PBO was submitted to PBO on 6th October 2019.

The Post Disaster Needs Assessment was conducted under the leadership of the Plan and Budget Organization, in close collaboration with the National Disaster Management Office of the Ministry of Interior. The assessment was done by the line ministries, relying on data and estimates from relevant departments and officials from the affected provinces. The UN agencies in Iran supported the respective line ministries in drafting the sector reports, with UNDP facilitating the compilation of the sector reports.

The assessment covers three most affected provinces: Golestan, Lorestan and Khuzestan for 10 of the 13 sectors. However, for health sector, no data was provided by the Ministry of Health and Medical Education (MoHME). Therefore, this sector was not addressed in the PDNA report. For the three sectors – Agriculture, Gender and Social Inclusion, and Education, damage and loss data for Khuzestan was not available at the time of the PDNA. Therefore, the recovery needs for Khuzestan province for these three sectors were not estimated. A Terms of Reference defining the geographic scope and sectors to be assessed was decided and endorsed by the PBO. Accordingly, 12 sector teams were formed with representatives of line ministries and UN agencies.

The Assessment methodology followed a five step process:

1. The collection of pre-disaster baseline data to compare with post-disaster conditions;
2. The analysis of the disaster effects with an estimation of Damage and Loss for each sector;
3. An assessment of the impacts of the disaster on the sector;
4. An estimation of the recovery needs for the sector; and

5. A sector recovery strategy proposing appropriate interventions, implementation arrangements, policy recommendations.

In addition to estimating Damage, Loss and Recovery Needs for each sector, the sectors have attempted to integrate four cross cutting issues into the sector assessment. These include gender and social inclusion issues, addressing disaster risks, livelihoods and environmental sustainability.

Most of the sectors have quantified the damage, loss and recovery needs in monetary terms providing the replacement value for the assets and infrastructure. The loss for all productive sectors of the economy was also estimated, this includes the revenue loss and higher operating costs for public sector services. The values assessed by all the sectors have been aggregated, to arrive at the total cost Damage and Loss for the three flood-affected provinces. In terms of estimating recovery needs, an additional cost for replacement of infrastructure and asset was added to make it disaster resilient.

The additional costs for disaster resilience vary from sector to sector depending on the acceptable levels of "risk" and resources agreed by the relevant ministry/ department as well as for including the principles of *building back better* in recovery. Care was taken to avoid double or multiple counting in estimating the value of the damage, loss and recovery needs. Furthermore, the aggregated value of damage and loss as well as qualitative information available from various sources have been used to derive the overall economic impact of the floods at the provincial level. The assessment has also attempted to provide an overarching strategy for guiding flood recovery across all sectors assessed.

Limitations

The estimations of the damage and loss by the Assessment Team were based on the data made available by the various line departments. It must be noted that the data on damage may vary in granularity as the various sectors reflect data collected from the affected provinces districts within the timeframe of two weeks. The data may not be representative of the entire sector and it was not possible to validate the data through field visits. This assessment presents a consolidated view, based on relevant information received and the expertise of a multi-institutional and interdisciplinary assessment team. It neither supersedes nor disregards the assessments of damage and needs made by other entities.

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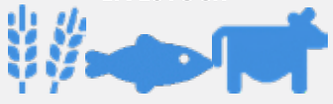
Summary of Disaster Effects and Impacts

The floods resulted in a death toll of 29 across Golestan, Lorestan and Khuzestan provinces. The 2019 floods caused maximum impact on Housing, Power, Telecommunication, Agriculture, Livestock, Fisheries and Livelihoods. Damage suffered by the key sectors that were most affected by the floods is captured in the following infographic.

SECTORS	DAMAGE
HOUSING 	Total houses damaged in both urban and rural areas **26,357** needing reconstruction **42,792** needing repair
EDUCATION AND CHILD PROTECTION 	**882** Primary and secondary schools damaged[1] **324** in Golestan **444** in Lorestan **114** in Khuzestan
CULTURAL HERITAGE AND TOURISM 	Monuments and traditional workshops damaged **Golestan**: 149 listed monuments and 15 non-inscribed monuments; 381 traditional workshops **Khuzestan**: 72 cultural heritage structures;76 traditional workshops **Lorestan**: 71 sites and monuments; 150 traditional workshops
AGRICULTURE, FISHERIES AND LIVESTOCK[1] 	**102838** hectares of field crops and orchards affected **3,339** livestock killed **1,546,000** Poultry birds killed
EMPLOYMENT AND LIVELIHOODS 	**Lost employment by sector:** **33540** in Agriculture **8876** in Industry and mining **897** in Tourism **3958** in Carpet weaving **912** in Cooperatives **6680** in Guilds **2863** in Home Jobs **293** in other economical units **58019** jobs lost in total
TRANSPORT 	**14,000** kms of roads damaged **725** bridges damaged or destroyed IRR **120** billion worth of damage to railroads

1. Data is belongs to Golestan, Lorestan and Khuzestan
1. Figures are for Golestan and Lorestan; Data for Khuzestan was not available

ENERGY

30,737 clients with gas connection cut off
167 km gas distribution pipeline damaged
87 gas pump stations affected
262 electrical substations damaged
331 Km of Grid affected

WATER AND SANITATION

12,332 water supply systems with major damages **83,296** partially damaged

10,000 toilets partially or totally destroyed
766 km of water supply pipes damaged
64,093 m3 water reservoirs tanks damaged
152 pumping stations damaged
97 water boreholes affected
24 water treatment plants damaged
68 water springs fully damaged
108 Km of waste water pipes fully destroyed
29 wastewater treatment plants fully destroyed

ENVIRONMENT

618,000 ha of forest and rangeland severely damaged
70 natural and artificial water springs damaged
500 ha of land at the Golestan National Park
2 conservation units completely destroyed
25 springs were destroyed in protected areas

IRR 30 Billion damage to Natural Parks
IRR 109.5 Billion damage to Wetlands

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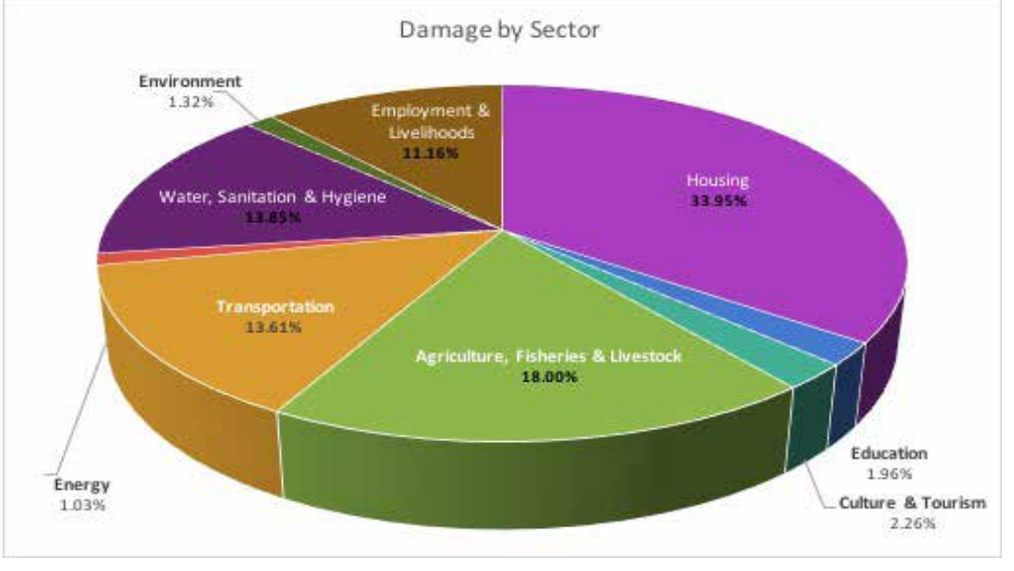
The assessment estimates the total damage to be IRR 128,043.04 Billion (USD 1,217.33 Million) and total loss to be around IRR 26,629.20 Billion (USD 253.16 Million).

Table 2: Damage and loss by sector

No.	Sectors	Damage		Loss		Total Effect (Damage+Loss)	
		Rials (B)	USD (M)	Rials (B)	USD (M)	Rials (B)	USD (M)
1	Housing	43,473.80	413.32	0.00	0.00	43,473.80	413.32
2	Education	2,503.84	23.80	106.50	1.01	2,610.33	24.82
3	Culture and Tourism	2,896.49	27.54	117.13	1.11	3,013.62	28.65
4	Agriculture, Fisheries & Livestock	23,049.01	219.13	16,836.92	160.07	39,885.93	379.20
5	Transportation	17,425.00	165.66	4,636.85	44.08	22,061.84	209.75
6	Water, Sanitation & Hygiene	17,731.00	168.57	40.00	0.38	17,771.00	168.95
7	Community Infrastructure	0.00	0.00	0.00	0.00	0.00	0.00
8	Energy (Electricity & Gas)	1,320.40	12.55	4.80	0.05	1,325.20	12.60
9	Employment and Livelihoods	14,296.00	135.92	0.00	0.00	14,296.00	135.91
10	DRR	3,654.00	34.74	4,887.00	46.46	8,541.00	81.20
11	Environment	1,693.50	16.10	0.00	0.00	1,693.50	16.10
12	Gender and Social Inclusion	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL	**128,043.03**	**1,217.33**	**26,629.20**	**253.16**	**154,672.22**	**1,470.51**

Figure 2: Damage by sector



Recovery Needs

For the Recovery Needs, with the end of the PDNA as the zero/starting point, the following timeframe is used to categorize them into short, medium and long term:

- Short term: 0-18 months (up to 1.5 years)
- Medium term: 18-36 months (from the 18th month to end of the 3rd year)
- Long term: 36-60 months (from the 3rd year to end of the 5th year)

In order for the provinces to recover from effects of the floods, the needs of the sectors were identified and estimated. In general, the needs can be categorized into two with the following objectives:

1) to restore the standard of living of the people and regain livelihoods and sources of income through:
   a) immediate repair and reconstruction of damaged and destroyed assets;
   b) direct financial grant or assistance to affected families; and
   c) subsidized loans in order for enterprises to be re-capitalized.
2) to build back better through investment in disaster risk reduction and management at the national and local levels for:
   a) early warning systems
   b) scientific studies and
   c) capacity-development across sectors.

The estimated recovery needs are IRR **159,211.83** Billion (USD **1,513.66** Million).[1] The short-, medium- and long-term recovery needs for the sectors are shown in the table below.

Table 3: Short-, medium- and long-term recovery needs by sector

	Sectors	Short-term		Medium-term		Long-term		Total	
		Rials (B)	USD (M)	Rials (B)	USD (M)	Rials (B)	USD (M)	Rials (B)	USD (M)
1	Housing	74,631.04	709.53	0.00	0.00	0.00	0.00	74,631.04	709.53
2	Education	2,915.87	27.72	0.00	0.00	0.00	0.00	2,915.87	27.72
3	Culture and Tourism	2,390.09	22.72	138.52	1.32	144.14	1.37	2,672.76	25.41
4	Agriculture, Fisheries & Livestock	1,471.70	13.99	6,243.10	59.35	0.00	0.00	7,714.80	73.35
5	Transportation	5,227.50	49.70	8,712.49	82.83	3,485.00	33.13	17,425.00	165.66
6	Water, Sanitation & Hygiene	15,660.00	148.88	2,551.00	24.25	0.00	0.00	18,211.00	173.14
7	Community Infrastructure	385	3.66	430.00	4.09	445.00	4.23	1,260.00	11.98
8	Energy (Electricity & Gas)	52.50	0.50	60.00	0.57	50.00	0.47	162.50	1.54
9	Employment and Livelihoods	6,349.00	60.36	14,465.00	137.52	0.00	0.00	20,814.00	197.88
10	DRR	1,135.00	10.79	2,485.00	23.62	4,130.00	39.26	7,750.00	73.68
11	Environment	122.00	1.16	227.00	2.16	1,140.00	10.84	1,489.00	14.16
12	Gender and Social Inclusion	3,124.39	29.70	1,041.46	9.90	0.00	0.00	4,165.86	39.61
	TOTAL	**113,464.09**	**1,078.71**	**36,353.57**	**345.61**	**9,394.14**	**89.30**	**159,211.83**	**1,513.66**

1. Calculations are based on the exchange rate of 1 USD = 105,183 IRR

Economic Impact

The economic impacts of disaster in Golestan and Lorestan provinces were assessed in this report and the results are illustrated in the following sections.

Recovery Strategy: Building Back Better in Iran

Unlike past disasters, the impact from the 2019 floods was far more widespread, affecting 25 of the 31 provinces, primarily rural areas, and all sectors of the society, economy and environment. This warranted a comprehensive and multi-sectoral approach to recovery that not only restored lives and livelihoods of those affected, but also used the floods as an opportunity to address some of the underlying risk factors and to build back better to a state of resiliency.

The results of the PDNA captured in this report revealed that the spring floods of 2019 severely impacted the rural households, particularly the poor. The impact at the household level was compounded by damage to houses that also acted as workspaces, loss of crops, livestock and fisheries, disruption of vital transportation links and access to markets, loss of livelihoods related to handicrafts and tourism, among others. It is therefore critical that the government along with its partners implement appropriate measures to address the social and economic effects and impacts of the floods at the household level, to facilitate their faster recovery and to avoid negative coping mechanisms that further exacerbate their state of deprivation. Equal attention should be paid to strengthening capacities at the national, provincial and local level for resilient recovery and risk-informed development.

Based on the PDNA, sector-specific recovery strategies and associated needs are elaborated in the respective chapters. The recommended actions outlined in the recovery strategy section highlights some of the key areas that need a focused attention due to the scale and specific impact of the 2019 floods. While the damage and loss figures might be underestimated- due to the limited geographical coverage, limited time frame for the assessment, and challenges related to quality and accessibility of data- the PDNA process and ensuing discussions highlighted some of the pre-existing or underlying risks that rendered people vulnerable to the impacts of the disaster.

Proposed Guiding Principles for the 2019 Flood Recovery

As demonstrated by the PDNA results, the 2019 floods impacted all sectors – social, productive and infrastructure. Given the multi-sectoral nature of recovery, it is critical to agree on a common set of principles that all sectors would adhere to. Irrespective of the sector, aspiring for a resilient recovery process that recognizes the differential impact of the floods on the people requires that the implementation of recovery measures be guided by the following principles[1]:

Build back better (BBB). Recovery process should aim to reduce vulnerability and improve living conditions while promoting effective reconstruction. The 'build back better' approach signifies policy commitment to right-sizing, right-siting and improving the resilience of social and economic infrastructure.

Convert adversity into opportunity. Disaster recovery can be an opportunity to rebuild/recalibrate old practices, systems and infrastructure with more affordable and resilient improvements.

Pro-poor recovery. Prioritizing the needs of socio-economically vulnerable individuals and groups in recovery If their needs are ignored, the poor and vulnerable are more susceptible to future hazards and shocks. Disaster recovery programs should include the provision of direct support to restore livelihoods and income generation opportunities. Equitable and inclusive recovery through participation of vulnerable groups: Prioritize the needs of the most vulnerable, which include poor farmers, the informally employed people, people with disabilities, women-headed households, and people in extreme poverty. Recovery interventions will, therefore, be based on equity across income levels and gender, with a specific orientation on how the flood survivors can contribute to the recovery process.

1. Guide to Developing Disaster Recovery Frameworks (World Bank: 2015) provides examples of successful disaster recovery experiences from around the world

Equal emphasis on recovery of social and economic infrastructure: Equal focus on the reconstruction of houses and social services like hospitals and schools, as well as vital services that will enable economic activities to recover immediately and restore and sustain the livelihoods and income of the population. This will include power, water supply, production inputs, transportation, restoring supply chains, etc.

Risk-informed recovery incorporating local knowledge and practices: The reconstruction of destroyed and damaged assets will ensure that similar events will not result in the same tragedy for the people. Recovery will, therefore, be risk informed to be disaster resilient while maintaining local artisanal designs.

Multi-hazard resilient infrastructure: The structural designs and location of all public and private infrastructure will take into consideration the risks not only from floods but also other hazards, making them multi-hazard resilient. Relatedly, the recovery activities will ensure that environmental risks are taken into account to prevent degradation of the environment.

Priority Areas

Iran has faced multiple disasters in the past, including severe earthquakes such as the 2003 Bam earthquake. However, most disasters were limited to specific Provinces. While the country is not new to floods, the scale of impact of the 2019 floods was unprecedented in its breadth, with significant impact on the rural areas. It is critical that the recovery strategy and the recovery plan reflect the widespread, multi-sectoral and rural nature of the disaster. Therefore, in addition to the sectoral strategies and needs, based on insights gathered during the PDNA, contextual knowledge as well as relevant international best practices, it is recommended that the recovery process gives specific attention to the following areas. It is important to note that the sectoral strategies and interventions should be linked to actions and guided by the concept of resiliency.

Resilient Housing

Given the extensive damage suffered by the housing sector, one of the key priorities of the disaster recovery activities should be housing recovery. Particular attention should be given to rural housing, as 85% of the houses slated for reconstruction in the three affected provinces are rural homes.

Housing recovery should not only be equitable, inclusive and participatory, it should also promote resiliency, sustainability and environmental efficiency while accommodating specific socio-economic and cultural context of the rural communities in the affected villages. In addition to better enforcement of regulations that restrict construction of houses on unsafe risk-prone location, given the extensive damage of rural homes, efforts should be made to develop, expand and build new rural sites according to the current social, environmental (including energy conservation ad green technology) and economic needs with the provisions of multi-hazard mitigation measures.

As an urgent need, innovative approaches can be looked at to rebuild efficiently with build back better features. The reconstruction of housing may be implemented using the following mechanisms[1]:

1. Owner-driven reconstruction: under this mechanism, government provides financial and technical assistance to eligible homeowners (determined through an objective criteria). The homeowners take responsibility of reconstruction of affected houses to meet their specific needs, in accordance with the technical guidelines provided by the government. Disbursement of financial assistance by government authorities is contingent on compliance of the construction process with the technical requirements, at critical stages. This ensures that the reconstructed homes are safe and resilient to future disasters. Owner-driven reconstruction can introduce disadvantaged groups to the banking sector as the fund disbursements are made through bank transfer to the beneficiary's account. It also allows for the reconstruction funds to circulate in the local economy. In many instances, meaningful participation through the owner-driven approach unlocks financial contributions from the homeowner.

1. This was adopted by the Government of Gujarat after the 2001 earthquake as well as in Haٍiti after the 2010 earthquake.

2. Public-private partnership mechanism: under this mechanism, the reconstruction of private housing is carried out through a partnership arrangement among government, NGOs and private partners. The agreement in the form of a Memorandum of Understanding (MoU) or other appropriate legal instrument should stipulate the percentage of the total cost of house reconstruction (including the cost of land acquisition) that will be borne by the government, NGOs and/or private donor.1 In the case of in-situ rehabilitation of flood-affected homes, partners could also agree on sharing the costs associated with both private housing and public infrastructure such as schools and health centers.

Retrofitting of homes:

Wherever applicable, retrofitting of partially damaged homes may be used as a cost effective approach as compared to new construction and transitional shelter. Homeowners can provide inputs on retrofitting solution, which leads to greater homeowner satisfaction, participation and livelihood recovery. Retrofitting also puts rental properties back on the market.

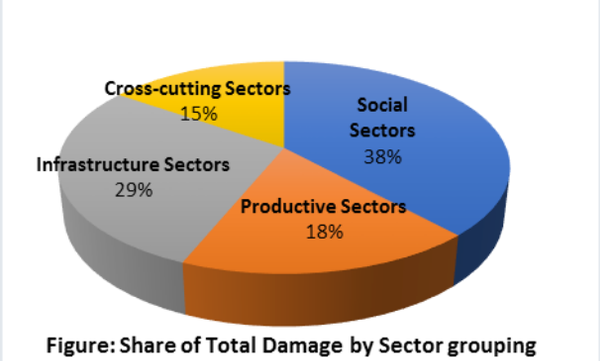


Figure: Share of Total Damage by Sector grouping

In addition to the above, for successful housing recovery, the following aspects require careful consideration:

- Regular and clear communication on the information on housing assistance packages to potential beneficiaries;
- Promoting an inclusive and participatory process by offering homeowners the choice for relocation or in-situ reconstruction, where applicable;
- Making multi-hazard resistant reconstruction mandatory;
- Linking payments for new construction to verification of compliance at specific construction stages to ensure multi-hazard resistant construction;
- Implementing awareness generation and confidence building measures for homeowners on safe construction using audio-visual tools including videos, folk songs, etc.;
- Ensuring design and construction quality by developing design procedures using simplified, locally applied international standards, in the absence of fully developed building codes.

Resilient Infrastructure

With the infrastructure sectors – Transportation, Energy (electricity and gas), Water, Sanitation and Hygiene – contributing to 29% of the total damage (IRR 36,476 Billion), building these back to resilient standards is of high priority. Along with the restoration of services in the short term, their resilience to future disasters should be built by modifying existing regulations and safety standards/codes in accordance with multi-hazard risk assessment.

All efforts must be made to avoid building critical infrastructure facilities in risk-prone areas. However, in unavoidable circumstances, suitable risk mitigation measures should be adopted. The PBO can play a significant role in ensuring this by specific screening the recovery projects before the funds are allocated. It is important to note that even with risk reduction and mitigation measures, the increasing intensity and frequency of hydro-meteorological events call for better preparedness to respond, including emergency plans prepared and tested prior to the disaster, backup supplies and equipment, and trained personnel. To ensure liquidity for immediate response and recovery of critical infrastructure after a disaster, comprehensive insurance coverage of all assets and installations of infrastructure is recommended.

While the infrastructure sectors mentioned above are critical for the social and economic recovery of those affected and the country as a whole, given the rural nature

1. In Gujarat, NGOs assumed half of the total cost while the government contributed the other half.

of this disaster, special attention needs to be given to the **restoration and rebuilding of community infrastructure**. In the absence of accurate information on the nature and extent of damage to community infrastructure in the three provinces, the damage and loss to community infrastructure could not be estimated. Hence it is critical to conduct a detailed assessment of critical infrastructure in the affected provinces and to revise recovery needs presented by local governments for funding.

Emphasis should be on putting in place a network of community infrastructure that links all households and segments of population to national and district level services, infrastructure, markets and social development efforts, and on creating equitable opportunities for social and economic development at the public level. Because of the local nature of community infrastructure, its recovery provides the opportunity to promote appropriate technologies, using local materials for flood-resistant construction, and to manage their effective operation and maintenance better through community engagement. However, special efforts should be made to raise local awareness and understanding of disaster resilient construction. Mechanisms need to be established to support local people (through using low profit loans, technical assistance, etc.) to ensure that all communities and population groups have access to minimum infrastructure services access to disadvantaged sections, groups with specific needs such as children and PWD, and women.

Building resilience through effective Disaster Risk Management

While Iran has made significant investments in the past to strengthen its early warning and emergency response capacities, these were tested by the intensity of the floods. Also, despite the advancements in earthquake engineering and incorporation of earthquake safety features in infrastructure and social sectors, less attention has been paid to a multi-hazard approach to risk reduction that takes into account other hazards such as floods.

Building on the existing capacities in Iran, the following recommendations are made to strengthen the disaster risk management system (from preparedness to response and recovery) to enhance its resilience to future disasters as well as to promote risk-informed development:

Investing in weather forecasting and early warning systems. An inventory of forecasting and early warnings systems should be undertaken. Upgrading the necessary equipment and training personnel for observing, detecting, forecasting of weather- and climate-related hazards will prevent and mitigate future disasters. Public participation in information dissemination of early warnings should be encouraged by using mobile phones, and other applications. Special attention should be given to the specific needs of vulnerable populations including women, children elderly, people with disabilities, etc.

Hazard Mapping and Risk Assessment. Multi-hazard and risk maps can be generated by the scientific research centers with the support of the government. New technologies like satellite imagery and remote sensing will be vital both in hazard mapping and post-disaster assessment. These tools will also be useful in reviewing, among others, the building codes, zoning regulations and re-estimating buffer zones across bodies of water as well as landslide prone areas.

Strengthening Preparedness for Recovery. The experience and lessons learned during the conduct of the PDNA can be institutionalized within the government. First, baseline data information across sectors and levels of governments should be collected and be readily available. Second, line ministries and local governments should be trained in the systematic assessment of damage, loss and needs as well as in the preparation of a recovery plan. The PBO can initiate discussions on how to conduct post disaster assessment and recovery in the future. Capacitating the local governments in post-disaster assessment will ease the burden of resource allocation from the national government. This can be done by developing simplified guides for each sector on how to conduct post-disaster assessment and recovery planning.

Capacity building of the government at various levels and across sectors. Preparing for disaster recovery will require training and explaining the mechanisms that should be in place prior to a disaster including those related to legislation, policies, financial arrangements, implementation, monitoring and so on. *Preparedness for recovery* will

prepare recovery schemes and approaches that can be applied effectively when a disaster occurs.

Organizing local community-based disaster risk management (CBDRM) organizations. Raising disaster awareness should entail the formation of CBDRM organizations. Local governments should be encouraged to vigorously form such organizations where evacuation plans and emergency-related standard operating procedures (SOPs) can evolve. Family preparedness should be encouraged to develop a culture of safety among the population. At the beginning, this may require capacity-building both for the local governments and communities.

Budget allocation for emergency. The government may consider allocating budget for emergency operations to selected ministries to expedite their response in cases of disasters and emergencies. This could be in the form of a National Disaster Risk Reduction and Management (DRRM) Fund for disaster response and a separate Quick Response Fund (QRF) which is part of the national budget intended for the relief, aid and rehabilitation of communities or areas affected by disasters.[1] The QRF may be incorporated into the annual regular budget of the various national government agencies engaged in disaster response. The use of the QRF should not require the approval of the Office of the President or any agency but should rely on certain levels of disaster effects to trigger the release of funds for emergency purposes. When the QRF is depleted, the agency may send a request for replenishment to be sourced from the National DRRM Fund for approval by the Office of the President or any appropriate authority.

Mainstreaming disaster risk reduction in the planning process and investment decisions. The government may wish to review its planning parameters to ensure that disaster risks and climate change are considered. Relatedly, disaster concerns can be integrated in the investment decision parameters or criteria in approving public investment projects. For instance, the government of Lao PDR revised and updated their planning manuals and public investment project guides to include disaster risk reduction and climate change concerns.[2] It is intended to ensure that DRR/CCA issues are integrated and addressed in the national development planning process and sectoral plans and project proposals submitted for public investment.

Restoring Livelihoods

Along with the reconstruction of physical infrastructure and replacement of assets, the recovery projects should aim to restore livelihoods, especially of those who are vulnerable as well as those who have lost their livelihoods due to damage to agricultural fields, livestock, loss of agricultural or handicrafts related tools/ equipment or from damage to workshops.

The flood recovery should take into account the dependence of many rural households (especially women) on both agriculture and handicrafts for their livelihoods; livelihoods initiatives should prioritize such households who have lost both sources of income. While efforts are being made to restore agricultural fields for replanting, the use of uncultivated lands for other income-generating activities such as livestock breeding should be considered.

The early recovery processes should:

- Promote employment opportunities through building or repairing community infrastructures or flood defense systems, restoring water bodies, water channels and rivers aiming at reducing the natural catastrophe risks in future; reconstruction of embankments; preparation of damaged and washed-away agriculture lands for replanting; land and soil restoration;
- Regenerate economic and social conditions at the heritage sites with the involvement of the local communities;
- Provide adequate distribution channels for the sale of products compiled in damaged markets;
- Prepare required skilled workers for reconstruction process by providing technical and vocational training courses;
- Develop skills of communities in line with the new technologies to create resilient community infrastructure;
- Encourage entrepreneurship in the affected areas for creating new opportunities, such as establishing

1. As in the case of the Philippines.
2. This was adopted in 2015 in Lao PDR with the assistance of JICA.

permanent solid waste recycling sites which on one hand reduces the environmental impacts and on the other hand provides employment to local labor.

In addition to the above, in order to mitigate the impacts of disasters on the agricultural sector and help farmers, various insurance options might be considered as a medium to long term strategy. A weather-based insurance system may be designed to provide insurance protection against losses in crop yield resulting from adverse weather incidences. It could be designed to provide pay out against adverse rainfall incidence (both deficit and excess) and other adverse weather incidences like frost, heat, relative humidity, un-seasonal rainfall, etc.[1] Other options that offer insurance coverage both for borrowing and self-financed farmers with multi-risk coverage against crop loss caused by natural disasters (i.e., flood, drought, earthquake, and volcanic eruption, etc.) as well as pest infestation and plant diseases could also be considered.[2] Financial sustainability of disaster insurance solutions need to be studied in greater detail before adopting them.

Additional Recommendations to improve Efficiency of Recovery

Considering that the recovery activities have been implemented over the past months after the floods, this might be an opportune time to assess the effectiveness of these efforts, identify specific challenges faced and take appropriate actions to rectify those that did not work out. Additional actions are recommended for the Medium Term in order to improve the efficiency of the recovery efforts. Such improvements will have positive effect on the implementation of the recovery plan and hence are strongly recommended.

Review of existing implementation procedures and processes to expedite recovery. Delays in the implementation of recovery projects, especially those that need immediate reconstruction, should be avoided. The PBO and the NDMO can initiate review and discussions on the bottlenecks that cause delays to expedite the recovery process and propose correction of existing processes or new procedures and mechanisms to be developed within existing management structures.

Special Provisions for Emergency Procurement. Regular procurement processes may not be fast enough if applied to post-disaster recovery. Special rules may be needed to expedite the reconstruction of vital infrastructure.[3] This could be through granting special authority to all concerned government procuring entities to procure goods and infrastructure projects, for the purpose of providing rescue, recovery, relief, and/or rehabilitation efforts for, and to continue to provide basic services to victims in areas affected by the floods below a certain threshold value established by the government and for a specific duration.[4]

Establishment of a Contractor Registration and Classification System. Individuals and firms providing specific services (supply of goods, construction works, and consultancy services) can be registered through a pre-qualification process. Those who meet specific criteria are ranked and their information stored in a database for easy retrieval when a need arises. If there are sufficient number of pre-approved vendors meeting the specific requirements of a project/activity, instead of going through the process of advertisement and shortlisting, the qualified candidates maybe contacted for further processing. This significantly reduces the time taken in procuring goods and services.

Capacity building of local contractors and suppliers. The establishment of Contractor Registration and Classification System also allows to analyze the local market conditions and map available local and national capacities to provide such services. In the aftermath of a disaster, participation of local contractors and vendors can help circulate the funds into the local economy. However, in order to ensure meaningful participation of local contractors and suppliers, additional measures should be adopted to encourage them to register, build their capacities through trainings and

1. India has Weather based Crop Insurance Scheme (WBCIS) which has been piloted in the country since the 2003 Kharif (monsoon) season.
2. The Philippine Crop Insurance Corporation (PCIC).
3. In Indonesia in the aftermath of the 2004 Indian Ocean Tsunami, the Cabinet issued a special regulation that allowed the Agency for the Rehabilitation and Reconstruction (BRR) to appoint contractors for housing projects. It was originally valid till July 2006 but was later extended to December 2006.
4. In the Philippines, in the aftermath of typhoon Yolanda (Haiyan), after the President declared a State of National Calamity, the Government Procurement Policy Board passed Resolution No 34-2013, dated 14 November 2013

workshops to familiarize them with the recovery process requirements and regularly inform them of potential opportunities.

Expediting Transfer of Recovery Funds. Some of the delays in implementing recovery projects may be due to cumbersome procedures associated with transfer of funds from the central authorities to local implementing agencies. It is recommended that the PBO, in close cooperation with the NDMO, reviews the current processes (along with requirements including roles and responsibilities) for transfer of funds and adopt appropriate measures to expedite them.

Customs clearance. In addition to the adjustments to the procedures for the expeditious release of humanitarian assistance from the ports or airports, similar provisions would have to be made to facilitate clearance of materials for the recovery process. Special attention may be given to facilitate emergency donations from abroad and remittances to reach the affected population during the emergency and recovery phase when they are most needed.

Implementing the Recovery Strategy

The first step in translating the findings from the PDNA as well as the suggested recovery strategies is the development of the recovery plan.

The development of the Recovery Plan should be led by the Government – the PBO in conjunction with the Ministries with support from the NDMO, UN agencies and other partners. Both the PBO and the NDMO should strive for a decentralized approach for the implementation of the recovery plan, through provincial and local offices, where the coordination at the national level is complemented by similar structures at the provincial and local levels. Necessary technical and financial support should be provided to these sub-national entities to perform their recovery-related responsibilities effectively and, thereby, build their capacities to manage recovery initiatives in the future.

In addition to monitoring the implementation of the Plan projects, the Government will have an important role in establishing an enabling environment for the effective implementation of the recovery projects. This could be related to development of new laws/regulations/policies or modifications to the existing ones as recommended in the sector-specific strategies to build back better. In order to perform this role effectively, it is critical that the government (through the coordination structure at national, provincial and local level) at all times has a clear picture of the status of recovery projects.

Development of a Recovery Plan

To develop a recovery plan, it is recommended that the PBO (as the lead agency for recovery planning and budgeting) along with the NDMO (as the entity legally mandated to coordinate disaster recovery) initiate consultations with the ministries, local governments and with other stakeholders in order to **prioritize recovery needs and identify specific projects with funding requirements and responsible parties to achieve those needs.**

The recovery needs identified in the PDNA must be broken down into ministry-specific projects or activities with funding requirements over a given timeframe (short, medium and long-term) to indicate their level of priority or urgency. The PBO/NDMO should validate these priorities with the various ministries. Breaking down the aggregate needs into individual activities or projects will allow to:

- ***Identify the most urgent ones from the recovery needs.*** Not all of the indicated needs of each sector are urgently needed for immediate implementation. Thus, the government, through the PBO, can further evaluate and prioritize the needs of various ministries.
- ***Enable the government to analyze the potential socio-economic impacts***. The additional costs of recovery over time and their impacts on socio-economic targets of the national development plan (like public expenditure, GDP, budget deficits, tax revenues, balance of payments, the overall public debt management as well as poverty, welfare, employment, incomes and other social indicators) can be easily analyzed if aggregate needs are broken down into specific activities.
- ***Identify funding gaps over time per sector.*** Priority needs broken down into specific projects or activities spread over time will reveal how much additional budget will be needed annually to implement them. These activities must, therefore, be detailed in terms of activities and funding requirements on an annual basis. This will help in formulating a financing strategy for recovery.

Once the initial framework for the recovery plan is developed, it is recommended that consultations be held with all relevant stakeholders across the various sectors (including development partners, civil society organizations and private sector), provincial and local governments as well as communities of the affected areas.

Based on the feedback received from the consultations, the recovery plan may be finalized with a results-based management framework, with clearly articulated monitoring and reporting mechanism as well as a communication plan. This plan and the projects contained therein will further facilitate the resource mobilization efforts as well as the government's budgetary allocation decisions.

Institutional Arrangements for Recovery

In order to facilitate the development of the Recovery Plan and its efficient and effective implementation, it is recommended that the PBO/NDMO initiates immediate discussions and consultations with other ministries regarding their roles and responsibilities in developing a recovery action plan and its implementation. The following three options may be considered in developing and implementing the recovery plan.1

Option 1: The existing planning agency (or the PBO) acts as the lead agency who oversees the development of the plan, coordinates and monitors the implementation of activities. This option has an inherent advantage because of the PBO's knowledge of: a) the planning objectives; b) the approval procedures and processes; and c) has existing coordination mechanisms with other agencies necessary for the implementation of the recovery plan. Some setbacks of this model will include: a) the recovery activities will be an added work to the planning agency, making it a less priority task; and b) some specific skills needed may not be available at the planning agency.

Option 2: Create a new agency specifically mandated for the recovery activities.[2] The advantages of a new agency are: a) they have the mandate from the highest authority; b) they can be staffed with the appropriate expertise needed focusing only on the implementation; c) depending on the level of autonomy granted to the agency, they can implement recovery projects faster using their own financial management tools and processes that are not tied to bureaucratic processes of government approval. The drawbacks of this model are that such an agency might lead to duplication of government's functions and systems; might have high operating costs; deprive government of

1. Handbook for Disaster Recovery Practitioners (Asian Disaster Preparedness Centre, 2015).
2. This option was adopted in Indonesia after the 2004 tsunami, Gujarat, India after 2001 earthquake and in Nepal for the 2014 earthquake re-construction and in the British Virgin Islands and Dominica after the Hurricanes Irma and Maria in 2017.

the opportunity to build capacities of existing systems and public officials in recovery implementation. In certain cases, it might become difficult to terminate the life of this agency even after the recovery activities are implemented.

Option 3: Establish a time-bound Task Force or Committee that is mandated to plan, supervise and monitor the implementation of the recovery activities.[1] Such a temporary body with a specific mandate and definite lifespan could have the autonomy, decision making authority and technical competence necessary for the effective and efficient performance of its recovery functions.

Financing Options for Recovery

In order to meet the financing needs of the Recovery Plan, it is recommended that the government considers a range of options including internal revenues, loans and grants.

As an immediate measure, the government (the PBO) can develop a financing plan or strategy to accommodate the additional budgetary requirements for recovery once the annual expenditure requirements for recovery are finalized.

Depending purely on internal revenues, certain options may be considered:

National budget realignment. Budgets for future national projects can be shifted for urgent repairs and rehabilitation of priority infrastructure. In doing so, the government must examine which projects can be delayed in favor of new urgent recovery activities, and be aware of the potential implications to the national development.

Additional fees or taxation. Added fees or tax on certain items may be levied to finance related needs. For instance, fees from tourist sites may be increased to meet the cost of simple repairs. Airports or railways can take on added fees to finance repairs or even the upgrading weather forecasting. Taxing other non-essential products can also generate some amount to fund the recovery.

Review of existing subsidies. The government can review existing subsidies which can be realigned to and focused on temporarily finance recovery needs, especially those of the poor.

Public-private sector financing. The PBO can consider studying some possible collaboration with the private sector in rehabilitating damaged infrastructure through public-private partnerships (PPP) like build-operate-transfer (BOT) schemes.

Tax breaks for affected households and businesses. To assist households in rebuilding their damaged dwellings, certain measures can be provided by the government like limited suspension of paying real property taxes and exemption from paying building permits. The same can be extended to businesses especially those that employ a greater number of people. Aside from real property taxes, they can be extended deferred payment of income taxes or duty-free importation of production inputs, machineries and equipment.

In addition to the above, the PBO could look at other potential sources of funding including grants and loans from bilateral donors, regional development banks, development partners, private sector, etc

It is recommended that a **Resource Mobilization strategy** be developed aimed at for those areas within the recovery plan where funding gaps exist.

1. This option was adopted in the Philippines after the super typhoon Haiyan in 2013 and in Mozambique in 2019; The Government of Mozambique created "The Cabinet for the Reconstruction of Post Cyclone IDAI" by Decree 26/2019 on April 11, 2019.

Conclusion

Despite the unprecedented nature of the disaster and its impact, it is noteworthy that the Government of Iran was quick in responding to the needs of the survivors of the 2019 floods nationwide. Efforts are underway in reconstructing vital infrastructure and rebuilding homes and livelihoods. However, this report has noted some challenges which should be addressed for future efficiency in dealing with similar events.

The PDNA as a process has been used in Iran for the first time and the report has generated a lot of information that is useful not just for the current post-flood recovery but to build resilience against future disasters. The recommended actions stated in the recovery strategy along with sectoral and cross-cutting theme strategies can form the building blocks of a systematic recovery effort while laying the foundation for resilient and risk-informed long-term development of the flood-affected areas. There are several long-term recovery needs identified which are linked to the long-term sustainable development. Therefore, it is critical that these are included in the national development planning process (for the 7th Five Year Plan period) and are also reflected in the future annual budgeting processes.

For successful implementation of these efforts, it is important that the PDNA and its recommended actions become a government owned and government led process, using a consultative and partnership-based approach involving all relevant actors within the government across ministries as well as national, provincial and local governments, development partners, private sector, diaspora, civil society organizations and local community groups.

SECTOR SUMMARIES

Housing

The spring floods of 2019 caused significant damage to the housing stock in the affected provinces of Golestan, Lorestan and Khuzestan. Based on some preliminary evaluations of the NDMO, the total economic loss in the three provinces due to the floods has been estimated around IRR 350 – 400 trillion (about four times more than Kermanshah earthquake of 2017). According to the Housing Foundation damage survey for the affected areas, a total of 69,149 units of houses were damaged in the three provinces with 16,659 in the Golestan province, 31,810 in Lorestan province and 20,680 in Khuzestan province. The damage ranges from totally destructed houses to repairable housing units. The total damage to the houses is estimated at IRR 43,473.8 Billion and USD 413.32 million. Table 1 shows the distribution of houses affected by type of damage across the three provinces

Table 4. Number of houses affected in the 3 provinces

Province	Number of Houses Affected				
	Totally Destroyed for Reconstruction			Partially Damaged for Repair	Total Number
	Urban	Rural	Total	Urban and Rural	
Golestan	1,325	6,082	7,407	9,252	16,659
Lorestan	1,510	11,800	13,310	18,500	31,810
Khuzestan	1,200	4,440	5,640	15,040	20,680
Total	4,035	22,322	**26,357**	**42,792**	**69,149**

The estimated recovery needs for the housing sector is evaluated according to the needs for the reconstruction of the destroyed houses and the repair of partially damaged units. The needs for the reconstruction of a typical new housing unit (80 square meters in average) is estimated to be about 20 million IRR per square meter (IRR 1600 million for such units). However, for the repair needs, 30 percent of the reconstruction cost per square meter is accounted for an existing typical unit of about 100 meters in average (IRR 600 million for such units). An additional 10 percent has been added to the cost of a house as a provision for the Building Back Better (BBB), i.e. to build according to disaster resilient features. Due to the high impact of floods on houses, it is critical to address the building standards of housing for ensuring its durability in future disaster events. The total estimated recovery needs for the housing sector is IRR 74,631.04 billion (USD 709.54 million).

The assessment also recommends a review of the housing construction and provides designs options that are resistant to various hazards. It advocates the use of confined masonry, factory-grade steel frames with masonry infill walls or more sophisticated rapid and novel methods for housing construction, including the use of modular precast concrete housing units and light steel framed houses. In addition to suggestions on housing design and materials, it is recommended that households that were displaced by landslides be relocated in a new land with infrastructure which is environmentally sustainable. Moreover, it is recommended that selection of beneficiaries for housing loans and grants is based on prioritizing the needs of most vulnerable population such as people with disabilities, female headed households, and households that are to be relocated to new settlements. The chapter outlines the government assistance for reconstruction of completely damaged houses and repair of the partially damaged houses. As is the practice following disasters, the government will provide grants and loans to house owners for reconstruction and repair. Contractors hired by the government will work together with the house owners in constructing houses. The sector proposes some examples for rapid and resistant construction methods such as the 3D wall panel system, light steel frame structures (LSF), precast concrete modular units, or insulated concrete form (ICF) system.

Education

The education sector of the PDNA covers all educational services and facilities, both public and private. However, since the Ministry of Education was not available for the assessment, the data collected for damage and loss is limited to K to 12 for the public sector in Golestan and Lorestan provinces. Yet, the unquantified effects for Khuzestan is included. In the 2018-2019 academic year, 14,323 schools were operational in Golestan, Lorestan and Khuzestan provinces with a total of 1,523,283 students in primary and secondary levels. Based on the data received from the School Renovation Organization, the number of affected schools in the three provinces is shown in Table 5.

Table 5. Number of damaged schools in the 3 provinces

Description of damage to schools	Province			Total Number of Schools Affected
	Golestan	Lorestan	Khuzestan	
Extensive	24	112	70	206
Limited	300	332	44	676
Total	324	444	114	882

The damage to school facilities considered the structures and the educational supplies and materials. The following table shows damages to schools by province.

Table 6. Damage to educational facilities by province.

Province	Damage (IRR Billion) by Type of School by Province				Total Damage	
	Primary school		Secondary school			
	Structure	Supplies and Materials	Structure	Supplies and Materials	IRR (Billion)	USD (Million)
Lorestan	1,146.332	199.900	413.098	93.420	1,852.75	17.65
Golestan	656.450	17.350	284.375	10.480	968.655	9.23
Khuzestan	NA	NA	NA	NA	NA	NA
TOTAL	1,802.782	217.25	697.473	103.9	2,821.405	26.888

The loss incurred by the education sector is estimated to be IRR **106.50 billion** or **about USD 1 million** (**IRR 25.50 billion for Golestan and IRR 81 billion for Lorestan**) which includes the cost of clean up, provision of temporary classrooms, and additional expenses to ensure that schools are ready in time for the new academic year beginning in September 23, 2019.

The recovery needs, according to the School Renovation Organization, include clean up of debris (completed), reconstruction of schools (ongoing), purchase and distribution of educational materials (partially funded and ongoing) and purchased of temporary shelters for classrooms (partially funded). All these activities are planned to be completed in the next 18 months and therefore are considered short-term activities.

The overall recovery needs is **IRR 2,915.87 billion (USD 27.72 million)** out of which IRR 605 billion (USD 5.75 million) remains unfunded.

Culture and Tourism

The three provinces of Khuzestan, Lorestan and Golestan have large number of historical monuments and sites, historical fabric, museums and site registered on UNESCO world Heritage List as well as national heritage list. In total there are four UNESCO World Heritage Sites in the affected provinces. The high precipitation and flood caused physical damages to the monuments, mostly in the form of cracks in the ceilings, moisture in the walls and increasing deterioration of roof tiles and facade. Initial assessments conducted by teams for the monuments- managed by the Iranian Cultural Heritage Handicrafts and Tourism Organization (ICHHTO)- indicate that damage to monuments were caused by rainfall, flooding and scouring as well as by river flood, sea tides and objects being carried away by the flood waters. In addition, changes to the sites such as increased growth of plants after the rainfall/floods have also caused damage to the monuments.

In these provinces, there are a number of both industrial and home-based workshops related to handicrafts. More than 50% of the persons working in the handicrafts sector are women, who are income generators for the family.

As for the tourism aspect, Nowruz (from March 21 to April 2) and summer holidays are when most Iranians travel. Each year during Nowruz holidays, more than 70 million nights are reported for accommodation. The three provinces of Golestan, Lorestan and Khuzestan are among the top attractions for travelers during Nowruz holidays. There are several natural and cultural heritage sites in the mentioned provinces which are visited by the travelers. The floods prevented potential visitors from travelling to these provinces.

Most damage and loss in Intangible Cultural Heritage (ICH) can be seen in traditional handicrafts. As it was difficult to assess other instances of the ICH, the report focuses on handicrafts. The best possible instances, which represent ICH, are traditional craftsmanship and as this section has the most concrete facts, this report focuses on it more than any other instances of ICH.

The impact of the floods on culture, both tangible and intangible elements of it, also resulted in psycho-social disruption, with negative effects on community cohesion and resilience. Impact on the world heritage sites, however, due to their significant role in the livelihood and memory of the local communities, would expose much loss in the social context of the area.

In addition to the critical post-crisis measures to be adopted to facilitate the recovery of the sector, review of the extent of damages to cultural heritage monuments also suggest the need for detailed assessment to determine the appropriate management structure for the historical monuments, national and global values and priorities, and adequacy of post-crises measures. Such as assessment should be carried out for all three categories currently used for Cultural heritage sites, including the monuments registered in world heritage list or national heritage list, and museums.

The recovery needs, due to damage suffered by the handicraft sector, fall under three categories: (i) cost of reconstruction/repair of damaged or destroyed workshops, (ii) cost of replacement or repair of lost or damaged tools (including looms), and (iii) cost of finished products damaged or swept away or destroyed.

To facilitate recovery of the handicrafts and cultural heritage, recovery strategies in the short-, medium- and long-term focus on the following:

- Handicrafts: Supplying tools and instruments; Reconstruction or renovation of affected workshops; Replacement or compensation for lost products;
- Cultural heritage: Restoration and conservation measures; Regeneration of economic and social conditions; and monitoring and developing a HBIM database.

The estimated damage and loss for culture and tourism is shown in the table below.

- As for tourism, for short-term recovery of the tourism sector, tourist facilities that were insured prior to the floods could utilize insurance payouts for immediate repairs and restoration of their operations. Hence, assistance maybe provided to tourist facilities in claiming insurance pay outs and also making any adjustments to the price of services to accommodate the higher operational costs.
- Medium term strategies can focus on tourism promotion and campaign to bring greater focus and attract tourists to the tourist sites in the affected provinces through advertisement and marketing; organizing festivals and tourism events in the affected areas.

- Long-term recovery of the sector should focus on, among other things, development and implementation of a comprehensive Disaster Preparedness and Risk Reduction program for enhancing resilience of tourism sector to combat potential natural disasters. Capacity building of government staff and key stakeholders of the tourism industry (including private service providers) on disaster response, recovery and risk reduction related to tourism should be an integral part of this program.

Due to the unavailability of data at the time of preparation of this report, estimates of the recovery needs for the tourism sub-sector are not included.

Table 7: Damage and loss in the culture and tourism sector

Province	Damage IRR (Billion)	Damage USD (Million)	Loss IRR (Billion)	Loss USD (Million)	Total Effects (Damage+Loss) IRR (Billion)	Total Effects (Damage+Loss) USD (Million)
Khuzestan	1,468.57	13.96	43.04	0.41	1,511.61	14.37
Lorestan	699.03	6.65	26.70	0.25	725.73	6.90
Golestan	728.89	6.93	47.39	0.45	776.28	7.38
total	2,896.49	27.54	117.13	1.11	3,013.62	28.65

Table 8: Recovery needs for the culture and tourism sector

Province	short term		medium term		long term		Total	
	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Khuzestan	1,198.85	11.40	69.48	0.66	72.30	0.69	**1,340.64**	**12.75**
Lorestan	575.57	5.47	33.36	0.32	34.71	0.33	**643.64**	**6.12**
Golestan	615.66	5.85	35.68	0.34	37.13	0.35	**688.48**	**6.55**
Total	**2,390.09**	**22.72**	**138.52**	**1.32**	**144.15**	**1.37**	**2,672.76**	**25.41**

Agriculture

Further to the 2019 spring floods, a Post Disaster Needs Assessment (PDNA) was conducted for the Agriculture Sector in two highly affected provinces of Golestan and Lorestan. The PDNA was conducted in cooperation with the Ministry of Agriculture Jahad, Iran Space Agency, the Plan and Budget Organization and FAO. The team estimated the damage, loss and recovery needs during the PDNA process. Based on the assessment, the total amount of damage and loss in both provinces is **IRR 39,885.93 Billion (USD 1,502.53 Million)**.

Table 9: Damage and loss to agriculture sector by province

Province	Damage IRR (Billion)	Damage USD (Million)	Loss IRR (Billion)	Loss USD (Million)	Total Effect (Damage+Loss) IRR (Billion)	Total Effect (Damage+Loss) USD (Million)
Lorestan	13,003.58	123.63	1762.44	1,138.18	14,766.03	1,261.81
Golestan	10,045.43	97.40	15074.47	143.31	25,119.90	240.72
Total	**23,049.01**	**221.03**	**16.836.92**	**1,281.50**	**39,885.93**	**1,502.53**

The Ministry of Agriculture Jahad has estimated the total short-term recovery needs at IRR 1,471.7 Billion (USD 13.99 Million) and the total medium-term and long-term needs at IRR 6,243.1 (USD 59.35 Million).

The two affected provinces have a high production of agricultural goods. The provinces are self-sufficient and surplus production is exported to provinces in the country. Agriculture production from the two provinces also contributes to the total GDP of the country. The main goal of the Ministry of Agriculture Jahad is to become self-sufficient in production of agriculture. Given the critical importance of the sector in revival of the economy, it is important to invest in making the sector disaster and climate resilient.

Measures are proposed to improve practices in crop production, oilseeds, livestock management, fisheries and aquaculture protection and a climate resilient approach to horticulture. The recovery strategy also recommends a climate-smart agro-forestry and reforestation strategy, to address the limited forest cover and issues with slope land erosion. Finally, it is recommended that as part of the climate resilient agriculture focus, the protection of the wetlands and conservation of biodiversity in Urmia Lake and Hoor-Al Azim should be given priority while building local community resilience against climate change. In the long term, it is proposed that all national and provincial level agriculture development plans are reviewed for disaster risk reduction measures, such as early warning systems, damage and loss data systems for the sector be integrated into the plans.

Transportation

The floods and landslides of 2019 caused extensive damage to the transportation sector. The nature of the damage includes: (i) damage to roads, including shoulder damages, (ii) damage to bridges, (iii) damage to culverts and drains, (iv) damage to railways, and (v) damage to airports across the three provinces of Golestan, Khuzestan, and Lorestan. The heavy precipitation and resultant flooding and landslides caused damage to railways, airports, 14,000 kilometers of roads, and 725 bridges throughout the three provinces, interrupting people's access to goods and services. There was a notable loss in revenue for both government and private sectors due to the interruption in the operation of railways, roads, and airport during the flood. However, only the public sector was covered in this PDNA. According to the statistics by the Ministry of Roads and Urban Development (MRUD), the total assessed damage and loss to the public transportation sector is estimated to be around **22,061.84** Billion IRR (**209.75** million USD) as shown in Table 10.

Table 10: Public damage and loss by province and type of transportation*

Province	Damage		Loss		Total Effects (Damage + Loss)	
	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Golestan						
Roads	2,482.03	23.60	501.24	4.77	2,983.27	28.36
Maritime	0.00	0.00	0.00	0.00	0.00	0.00
Airports	3.15	0.03	0.00	0.00	3.15	0.03
Railways	600.30	5.71	325.19	3.09	925.49	8.80
Total	3,085.48	29.33	826.43	7.86	3,911.91	37.19
Lorestan						
Roads	7,265.06	69.07	1,385.03	13.17	8,650.09	82.24
Maritime	0.00	0.00	0.00	0.00	0.00	0.00
Airports	112.32	1.07	0.00	0.00	112.32	1.07
Railways	750.10	7.13	325.01	3.09	1,075.11	10.22
Total	8,127.47	77.27	1,710.04	16.26	9,837.52	93.53
Khuzestan						
Roads	5,242.00	49.84	1,850.37	17.59	7,092.37	67.43
Maritime	0.00	0.00	0.00	0.00	0.00	0.00
Airports	0.00	0.00	0.00	0.00	0.00	0.00
Railways	970.03	9.22	250.01	2.38	1,220.04	11.60
Total	6,212.03	59.06	2,100.38	19.97	8,312.41	79.03
Grand Total	17,424.9890	165.6635	4,636.8471	44.0836	**22,061.84**	**209.75**

*Note that since only three provinces are covered in this report, the total summary is understated.

The sector chapter presents strategies for recovery in the short, medium and long term. The short-term strategy for the road sector is comprised of activities to restore connectivity such as clearing debris from road surfaces, the rectification of surface damages, and repair of traffic structures and embankments. The medium-term objectives are to design modifications to roads, railways, and airports in accordance with flood zone maps and safety principles to decrease future damages to roads, bridges, and transportation infrastructures and prepare backup supplies and infrastructures for flood-prone locations. A medium-term strategy for the road sector includes planning and integration of the drainage infrastructure and the road network system to ensure proper flood drainage systems and regular maintenance of the transport, culverts and drainage infrastructures. Putting this strategy into action will assist the reduction of flood risk and enhance the resilience of the road network.

In the long-term plan, institutional strengthening with clear roles and responsibilities, adequate budgets to maintain the transport infrastructure network is proposed. Furthermore, in addition to improved designs to withstand multi-hazard, it is proposed that the infrastructure and assets of this sector are better protected through dedicated finance for maintenance and reconstruction of assets. The total recovery needs for all subsectors of transportation are estimated at IRR **17,424.97 billion (USD 165.7 million)** as shown in the table below.

Table 11: Summary of needs of the transportation sector by sub-sector

Sub-sector	Short-term		Medium-term		Long-term		Total	
	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Roads	3,485	33.13	6,273	59.64	2,613.75	24.85	12,371.75	117.62
Railroads	1,394	13.25	697	6.63	348.50	3.31	2,439.5	23.19
Airports	261.37	2.49	435.62	4.14	87.12	0.83	784.11	7.46
Maritime	87.12	0.83	261.37	2.49	87.12	0.83	435.61	4.15
Road infrastructure	0	0	1,045.5	10	348.50	3.31	1,394	13.31
Total	5,227.49	49.7	8,712.49	82.9	3,484.99	33.13	17,424.97	165.73

Energy

The floods caused moderate damage to the energy sector in the three provinces of Golestan, Lorestan, and Khuzestan. The energy sector is divided to 3 sub-sectors: Oil and Petrochemical, Gas, and Electricity. Oil sub-sector is not included in this report.

In the gas sub-sector, there was no damage to natural gas generation fields or any other natural gas operated power plant systems. However, due to damages in pipelines (distribution network), caused by landslides, disconnection occurred in 2 points for Khuzestan, 7 points for Golestan, and 260 points for Lorestan (including 44 cities and 711 villages). Gas was deliberately cut off in some points to avoid explosion due to gas leakage. In total, gas services to 30,737 clients in 755 villages in Khuzestan, Lorestan, and Golestan were cut off as shown in Table 12.

Table 12: Effects on the gas sub-sector

Province	Distribution Pipeline (Km)	Pumping stations and equipment	Number of affected transmission pipelines	Number of clients cut off	Number of cities cut off	Damage	
						IRR (B)	USD (M)
Khuzestan	0	27	2	3,461	42	270	2.566
Lorestan	165	41	260	27,276	711	540	5.133
Golestan	2	19	7	0	0	50	0.475
Total	**167**	**87**	**269**	**30,737**	**753**	**860**	**8.17**

In the electricity sub-sector, the floods damaged only the transmission and distribution towers and not the power generation units. Distribution grids in all 3 provinces had already been repaired temporary or permanently. Table 13 shows the damage to the electricity sub-sector.

Table 13: Effects on the electricity sub-sector

Province	Distribution				Tower/Rig and substation			
	Substation	Grid (KM)	Damage		Substation	Tower/Rig	Damage	
			IRR (Billion)	USD (Million)			IRR (Billion)	USD (Million)
Khuzestan	6	8.3	81.7	0.7768	1	115	**132.3**	**1.2578**
Lorestan	31	137	164.00	1.5592	NA	NA	0	0
Golestan	225	186	82.40	0.7834	NA	NA	0	0
Total	**262**	**331.1**	**328.1**	**3.1194**	**1**	**115**	**132.3**	**1.2578**

The total damage to the electricity sub-sector is **IRR 460.4 billion (USD 4.377 M)**. Although no long-term interruption of gas and electricity supply resulted from the damages to the assets, loss to the electricity sub-sector due to reduced sales is estimated to be **IRR 4.8044 billion (USD 0.051 million)**. At the time of preparation of this report, the Ministry of Oil, Gas and Petrochemical had not provided the estimated loss for gas sub-sector. The total effects (damage and loss) for the energy sector is estimated at IRR 1,325.204 Billion (US$12.599 Million). Almost all facilities and equipment are planned to be repaired and put back into temporary operation in the short term. This will include the reconstruction of transmission towers and stationary equipment for electricity and pipelines and stationary equipment for gas sub-sector. The medium-term priority includes disaster preparedness and mitigation measures, among others. The recovery needs for the electricity sub-sector are estimated at **IRR 162.5 billion (US$ 1.544 million)**. For the gas sub-sector, although the recovery activities were identified, the Ministry of Oil, Gas and Petrochemical has not provided the estimated cost of recovery.

Water, Sanitation and Hygiene (WASH)

The heavy rains, flooding and landslides in March and April 2019 have caused loss of lives, displacement and extensive destruction in 25 out of 31 provinces in Iran with Golestan, Khuzestan, and Lorestan provinces as the most affected provinces. Water and sewer systems have been severely destroyed/damaged affecting 115,000 people which were targeted for WASH sector emergency response assistance. The findings for the WASH sector, which was assessed by urban and rural areas, show that the aggregate damages are in water supply pipe lines, household connections, reservoirs, pumping stations, treatment plants, water boreholes, water springs, waste water pipelines and household latrines, etc. The aggregate loss in the WASH sector is generally from foregone income of the water systems, cleaning of debris, and other unexpected expenses from urban and rural water systems. The breakdown of the urban water supply caused major loss compared to rural water system since components like treatment plants, pumping stations, water supply pipe network and house water connections were fully damaged.

The total value of damage and change in economic flows to the WASH sector is estimated at **IRR 17,771 billion,** of which IRR **15,000** billion pertains to infrastructure and physical assets. Table 14 shows the breakdown of damage and loss both for the urban and rural areas.

Table 14. Damage and Loss in Water & Sanitation – Urban & Rural

WASH Infrastructure	No. of Units	Partially damaged	Total Cost of Repair IRR (Billion)	Fully Damaged	Total Reconstruction Cost IRR (Billion)	Total cost (Repair + Reconstruction)		Loss	
						IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Urban Water systems	67,928	61,136	3,367	6,792	1,459	4,826	45	22	0.21
Rural Water Systems	27,700	22,160	2,156	5,540	1,899	4,055	38	18	0.17
Urban Sewage systems	21,133	15,886	3,703	5,247	4,907	8,610	81	0	0
Rural sanitation (HH)	10,000	1000	24	9,000	216	240	2	0	0
TOTAL	**126,761**	**100,182**	**9,250**	**26,579**	**8,481**	**17,731**	**168**	**40**	**0.38**

The recovery and reconstruction strategy aims to return the sector to a better and more resilient state than the pre-flood status as quickly as possible, and enable it to resume progress towards restoring the national goal of universal access to water supply and sanitation.

Short-term recovery activities will build on what has initiated during the early phase of the disaster while medium-term projects will be more focused on implementing the water safety plan, sludge management; building community and institutional capacity in disaster risk management with building back better techniques, among others. The total needs for recovery and reconstruction using the principle of building back better is estimated at **IRR 18,211 billion.**

Community Infrastructure

Community infrastructure are low-cost small-scale infrastructure built over time through community-led initiatives according to the needs of the community. They are composed of facilities and systems such as religious buildings and mosques, local shops and market places, wells, water storage structures, workshop facilities, internal farm routes, etc., built at the community level which are socially, economically and operationally linked to lives and livelihoods of the community members. However, these structures are rarely registered in the official government records before disasters and are not normally included in the post disaster assessment. Thus, they are not addressed in recovery plans.

Although the necessary data on damage and loss to community infrastructure is not available, examination of overall impacts of floods in the three provinces of Lorestan, Golestan and Khuzestan, may help estimate the extent of damage to community infrastructure. In Table 15, some basic data about the provinces affected by 2019 floods is presented.

Table 15: Some basic information about the provinces affected by 2019 floods*

Province	Number of cities	Number of cities affected by floods	Number of villages (approx.)	Number of villages affected by floods	Roads (km)	
					Total	Rural
Golestan	30	5	1,000	56	4,301	3,103
Lorestan	25	11	3,000	964	7,053	5,177
Khuzestan	77	4	4,000	117	13,536	8,477

*Source: Ranking of Provinces According to Some 2016 Statistical Indicators (2019), Publications of Iran Plan and Budget Organization.

Since many villages were affected by the 2019 floods, it is expected that the community infrastructure in those places has been damaged significantly. The immediate need for the reconstruction of community infrastructure will include the clearing of debris and opening up of access to community sites. To ensure that community infrastructure will be mainstreamed as a sector that should be assessed after a disaster, database should be developed so that accurate inventories of community infrastructure at local levels are accounted for. This can include mapping of community assets and understanding pre-disaster socio-economic importance of such infrastructure for the people in all communities, including minorities and refugees. Given the importance of community infrastructure for the social and economic recovery of those affected by the floods, some needs are identified which include capacity building at local levels by raising public awareness and skills, involving local communities and developing highly participatory approaches, formulating necessary mechanisms to support local people (especially vulnerable population), creating new economic opportunities, as well as promoting appropriate technologies in line with Building Back Better (BBB) approach. The following table shows the summary of needs for the community infrastructure.

Table 16: Summary of Short-, Medium- and Long-term Recovery Needs at each Province

Province	Short-term		Medium-term		Long-term		Total	
	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Lorestan	323.4	3.07	361.2	3.43	373.8	3.55	1058.4	10.06
Golestan	23.1	0.22	25.8	0.25	26.7	0.25	75.6	0.72
Khuzestan	38.5	0.37	43	0.41	44.5	0.42	126	1.20
Total	385	3.66	430	4.09	445	4.23	1260	11.98

Disaster Risk Reduction

Disaster Risk Reduction (DRR) is defined as "the concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events". Therefore, DRR is a cross-cutting sector addressing broad perspectives related to recovery and response in many different areas. However, this report only focuses on specific aspects of DRR in the context of Disaster Risk Management (DRM), as addressed in the relevant UN, European Union and The World Bank guidelines, including:

- Overview of Iran's DRM profile and structure, their related governing laws and regulations, and existing institutional arrangements;
- Evaluation of damage and loss related to DRR relevant buildings[1], infrastructure and assets, and services provided by DRR and DRM institutions to survivors and its challenges;
- Introducing necessary measures for capacity-building and resilient recovery needed to Build Back Better (BBB).

Based on data gathered from different sources about the above aspects, it was estimated that the 2019 floods caused **3,654 Billion IRR (34.74 Million USD)** in damage and **4,887 Billion IRR (46.46 Million USD)** in loss to the DRR sector in the three provinces.[2]

Finally, based on PDNA, the most important recovery interventions to be implemented in the provinces affected by the floods in short-, medium- and long-term have been addressed. Some of those measures include strengthening the early warning systems, capacity building and promoting preparedness at the national, provincial and community level, preparing emergency response plans for different institutions, preparing initial action and standard operation plans, implementing necessary measures to prevent additional damage and loss, managing existing risks as well as the new risks that have emerged due to the floods.

The total budget needed for early recovery and BBB as well as capacity building in DRR sector is approximately around IRR **7,750 Billion (USD 73.68 Million)** to be allocated between 1 to 5 years. It should be noted that the cost of implementing DRM and DRR measures related to mitigation, preparedness, emergency response and reconstruction aspects should be also addressed in other sectors, as they have not been counted in the above mentioned figures.

Table 17: Summary of loss and damage in three affected provinces

Province	Damage		Loss		Total Effect (Damage + Loss)	
	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Lorestan	2,218	21.09	1,497	14.23	3,715	35.32
Golestan	654	6.22	1,518	14.43	2,172	20.65
Khuzestan	782	7.43	1,872	17.80	2,654	25.23
Total	3,654	34.74	4,887	46.46	8,541	81.20

1. Governor office, local offices of line ministries, monitoring stations, etc.
2. Calculated based on the exchange rate of 1 USD = 105,183 IRR

Table 18: Summary of Short-, Medium- and Long-term Recovery Needs

Recovery Cost							
Short-term		Medium-term		Long-term		Total	
IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
1,135	10.79	2,485	23.63	4,130	39.26	7,750	73.68

Table 19: Summary of Short-, Medium- and Long-term Recovery Needs for each Province

Province	Short-term		Medium-term		Long-term		Total	
	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Lorestan	499.4	4.75	1,093.4	10.40	1,817.2	17.28	3,410	32.42
Golestan	283.75	2.70	621.25	5.91	1,032.5	9.82	1,937.5	18.42
Khuzestan	351.85	3.35	770.35	7.32	1,280.3	12.17	2,402.5	22.84
Total	1,135	10.79	2,485	23.63	4,130	39.26	7,750	73.68

Environment

The 2019 widespread flooding in Iran affected, among others, the provinces of Golestan, Khuzestan, and Lorestan which are the focus of this assessment. Due to the floods, about 618,000 ha of forest and rangeland in Lorestan province have been severely damaged. Landslides damaged 70 natural and artificial water springs, 250 km of roads in protected areas, caused damages to environmental buildings and infrastructures, three air pollution stations and the waste disposal site. In Golestan province, about 500 ha of land at the Golestan National Park were damaged, including 100 km of forest roads, 5,000 meters of protective fences, the complete destruction of two conservation units and wildlife water pools. About 25 springs were destroyed in other protected areas of the province.

In some cities of the province of Khuzestan, parts of the municipal landfill were completely submerged and the dumping of rural waste around the Dez national park and Dez protected area caused the waste to be transferred to the Dez forest and river, which caused pollution in these areas. In addition, due to damages to petroleum-based mulch facilities, a big oil spill occurred in Karun River, close to Salmaneh village. Damages to oil rigs and bentonite supply facilities also caused pollution after the floods.

In addition, small dams and waterbreaks of watershed management system were totally destroyed and consequently large amount of soil was washed away. On top of all the debris produced from the collapsed buildings, the mud and silt deposited during the floods became an added problem to deal with. The floods have exacerbated the challenges of solid waste management in these three affected provinces.

Overall, most of the damage to the environment were on rivers, forests, wetlands and wildlife species, among others. The following table shows the environmental damages, which are public in nature, in the 3 provinces. The costing of the damages was based on the valuation by environmental experts, as explained in the methodology section of the Chapter.

Table 20. Damage to the environment in the 3 provinces

Province	Total Damages	
	IRR (Billion)	USD (Million)
Lorestan	1,499.1	14.252
Khuzestan	134.5	1.279
Golestan	59.9	0.57
Total	**1,693.5**	**16.101**

Observed loss to the environment was not quantified at this point, which includes the reduction of expected benefits from the ecosystem and biodiversity. Due to the floods, the upper organic layer of soil which was porous and rich in humus nutrients was washed away, thus, reducing the potential for absorbing runoff water as well as decreasing the rate of regeneration of native forest and rangeland.

Several trees and other plant species were uprooted destroying much of wildlife food sources and the habitat of many several species such as the squirrel. Moreover, the large deposit of mud in wetlands has reduced the effectiveness of these wetlands in preventing future floods. The excess water in some areas has led to the unusual growth of grass and some other plants, which increased the probability of fire, especially during the dry, hot seasons. The following table shows the needs of the environment sector.

Table 21. Summary of needs

Sub-sector	Needs (in Billion IRR)			Total	
	Short-term	Medium-term	Long-term	IRR (Billion)	USD (Million)
Lorestan	107	200	1,009	1,316	12.512
Khuzestan	9	18	90	117	1.112
Golestan	6	9	41	56	0.532
Total	**122**	**227**	**1,140**	**1,489**	**14.156**

Livelihoods

The pre-disaster statistics, based on the results of the 2016 survey of labor force, indicate that in Golestan, 26 per cent of employees work in manufacturing sector, 28.2 per cent in agriculture and about 45.9 per cent in services sector. In Lorestan, 29.5 per cent of employees are in manufacturing, 23.8 per cent in agriculture sector and about 46.7 per cent in services sector. In Khuzestan, 28.8 per cent of employees work in industry, 20.1 per cent in agriculture sector and the rest are active in services sector. Due to the damages caused by the floods in the sector/sub-sectors of agriculture, industry and mining, tourism, carpet weaving, cooperatives, guilds, home-based jobs and other economic activities, which is estimated at IRR 14,296 billion (USD 135.9), sources of income and employment have been disrupted. In Lorestan, more than 31,000 workers in agriculture, mining, tourism, carpet weaving, cooperatives and guilds sectors lost their jobs resulting in an estimated income losses of USD 32 million. In Golestan province, more than 17,000 workers lost their source of income in the same economic activities as those in Lorestan and income loss is estimated at about USD 18 million. In Khuzestan province, around 8,700 people in agriculture, industry and mining as well as those home-based workers lost their livelihoods totaling to an estimated income loss of USD 9 million. Table 22 shows the pre- and post-floods unemployment in the 3 provinces.

Table 22: Pre- and post-disaster unemployment

Province	Number of Unemployed			
	Before the flood	Additional due to the flood	Total after the flood	% Increase
Golestan	35,789	17,581	53,460	50
Lorestan	70,967	31,736	102,703	88
Khuzestan	161,027	8,702	169,729	5
Total	267,873	58,019	325,892	**21**

In total, more than 58,000 workers have temporarily lost their livelihoods due to the floods which is about IRR 6226 billion (USD 59 million) in lost wages. Immediately after the floods, the number of unemployed people in the 3 provinces increased from 268,000 to 326,000 persons or by 21%.

To regain lost employment, the Ministry of Labor, Welfare, and Social Co-operatives (MLWSC) has devised two different approaches within the short- and medium term. The first approach entails the implementation of supportive and incentive programs to support unemployed persons which include unemployment insurance payment, encouraging public employment in dredging, reconstruction and repair of public damaged buildings and infrastructure, and enterprise subsidy scheme to incentivizing enterprises to attract and employ unemployed population. The second approach is the reconstruction, restoration and rehabilitation of affected economic units through bank loans with minimal interest to reduce the cost of capital for business owners. The summary of needs to restore livelihoods is shown in Table 23.

Table 23: Summary of recovery needs in livelihoods sector

Province	Short-term		Medium-term		Long-term *		Total	
	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Golestan	874	8.31	2,352	23.33	NA*	NA*	3,326	30.67
Lorestan	1,552	14.76	2,589	25.52	NA*	NA*	4,141	39.37
Khuzestan	3,923	37.30	9,524	90.73	NA*	NA*	13,447	127.84
Total	6,349	60.36	14,465	137.52	NA*	NA*	20,814	197.88

Gender and Social Inclusion

Girls, boys, women and men experience natural disasters differently and their pre-existing vulnerabilities are exacerbated during and in the aftermaths of the crises. Social inequalities, including gender stratification of society, are the determinants of the nature and spread of the impacts of particular disaster the floods resulted in a death toll of 29 across Golestan and Lorestan provinces, out of whom 21 were male and 8 were female, with no age disaggregated data available.[1] By the same token, there were no reports stating the exact causes of deaths.[2]

Evidence from the flood hit provinces in March 2019 shows that among populations stricken by this disaster, girls, boys and women were the hardest hit. Further analysis of this evidence shows that certain social sub-groups including Female Headed Households (FHHs), People with Disabilities (PWDs) and Older Persons were among the most affected.[3] The pre-disaster status of these groups, especially when intersecting with gender inequalities, creates social vulnerability to disasters, resulting in their reduced ability to bounce back to normalcy in the post event. Among the challenges in the pre-disaster event for Female Headed Households are the burden of productive and unremunerated domestic work, under-representation in the formal economy and a higher poverty rate compared to Male Headed Households. The status of PWDs, especially of women and children with disabilities, before the disaster indicates multiple problems of limited access to social services and lack of social participation. Pre-flood data also suggests limited enjoyment of social services, income insecurity, loneliness and exclusion as well as the lack of a comprehensive care system for older persons in general. Extra burdens for older women are their role as the care giver for children and older men in the household, and their comparatively limited physical mobility due to socio-economic and cultural constraints.

While the material loss can be measured and assessed in monetary terms, the reports demonstrate that women and girls suffer a double disaster by being exposed to other impacts of the crisis that affect their well-being, including their health and Reproductive Health, education and income status. These impacts include but are not limited to increased workload; increased time devoted to reproductive work; decreased and riskier income-generating opportunities; increased dependency on men's income; loss of social and job-related networks; unwanted marriages out of financial necessity; increased stress and trauma; maltreatment; reduced privacy, safety and security; and in the case of girls, interrupted or completely terminated access to education.

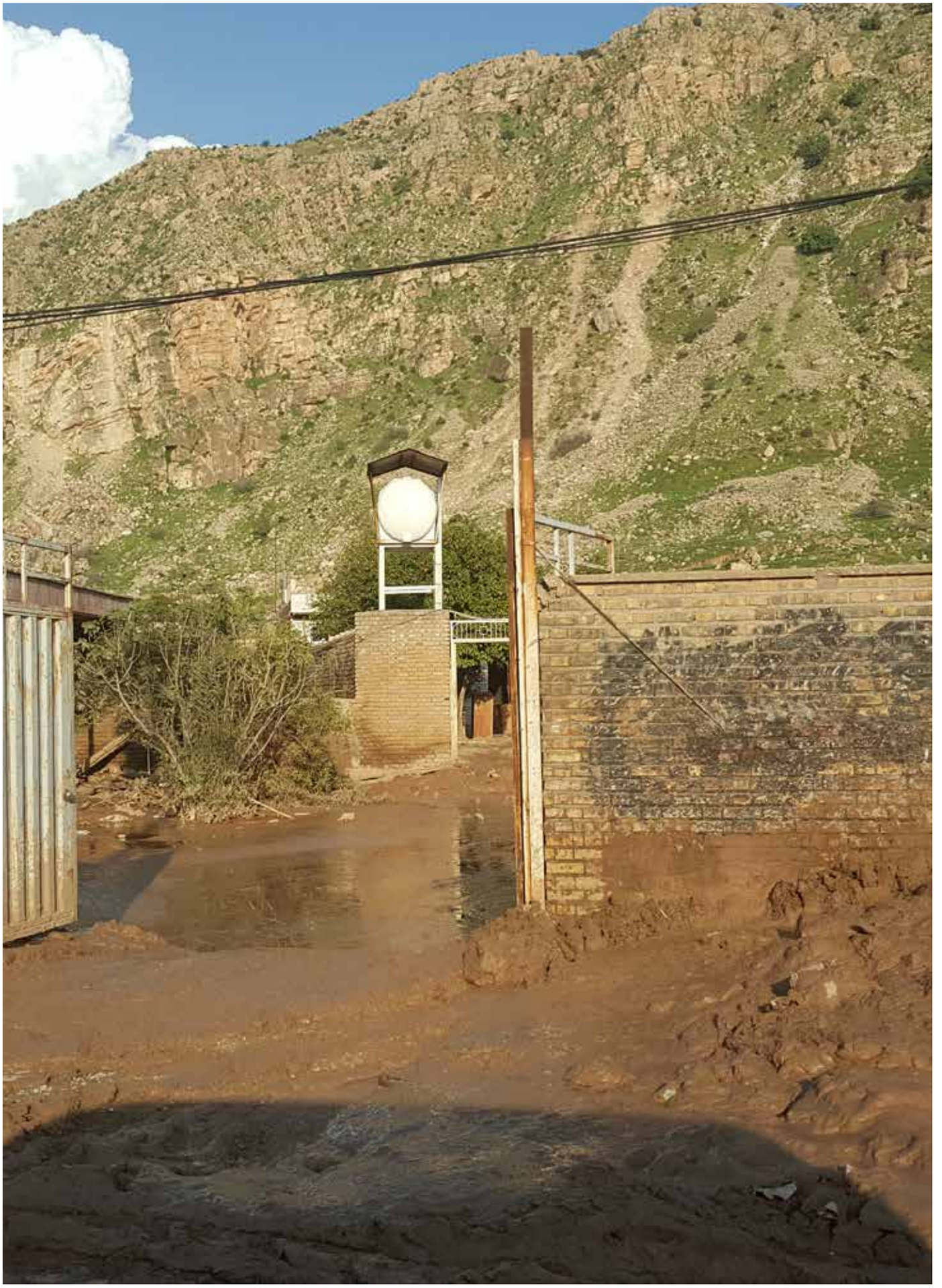
While the gender differentiated effects of the loss and damage to institutions, industries and the social protection system have been calculated and reflected in the other sectors report[4], this chapter identifies a wide range of factors affecting the gender-based vulnerabilities of FHHs, PWDs and older persons as already stated above. The recommendations propose a targeted investment in women through the upgrading of skills, and the provision of financial support by employing a micro finance scheme and the topping up of targeted cash assistance. They also include an expansion of health care services including those of mental and reproductive health to flood-affected populations to run alongside the targeted investment programme. The total estimated recovery needs of the sector is IRR 4,165.86 Billion (USD 39.61 Million) of which 55% will be allotted to Lorestan province and 45% to Golestan province. In discussion with VPWFA, it was agreed that the recovery needs will be met in 2 years. Hence the recovery needs are categorized into short term and medium term with 75% and 25% delivery of the recovery needs, respectively.

1. Natural Disaster Management Organization's report at the write-shop, 31st July 2019
2. There was limited data available from across the affected sites and populations, neither was there any resources available for a more thorough death toll assessment.
3. Reports received from Vice Presidency for Women and Family Affairs (VPWFA) provincial offices on 14th July 2019
4. The strategy also addresses the psychosocial needs of women in the target social groups by establishing Women Friendly Spaces for the provision of relevant support.

Table 24: Short- and medium-term recovery needs by province

Province	Short-term		Medium-term		Long-term *		Total	
	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Lorestan	1,718.42	16.34	572.81	5.45	-	-	2,291.22	21.78
Golestan	1,405.98	13.37	468.66	4.46	-	-	1,874.64	17.82
Total	3,124.40	29.70	1,041.47	9.90	-	-	4,165.86	39.61

One main concern observed by this assessment was the dearth of sex, age disaggregated data as well as lack of effective systems for data gathering and analysis at the national and local levels. This assessment reveals the importance of attending to the full spectrum of gender-based needs of the potentially marginalised social groups who may be excluded from the recovery process due to their less visible status in the flood affected areas.

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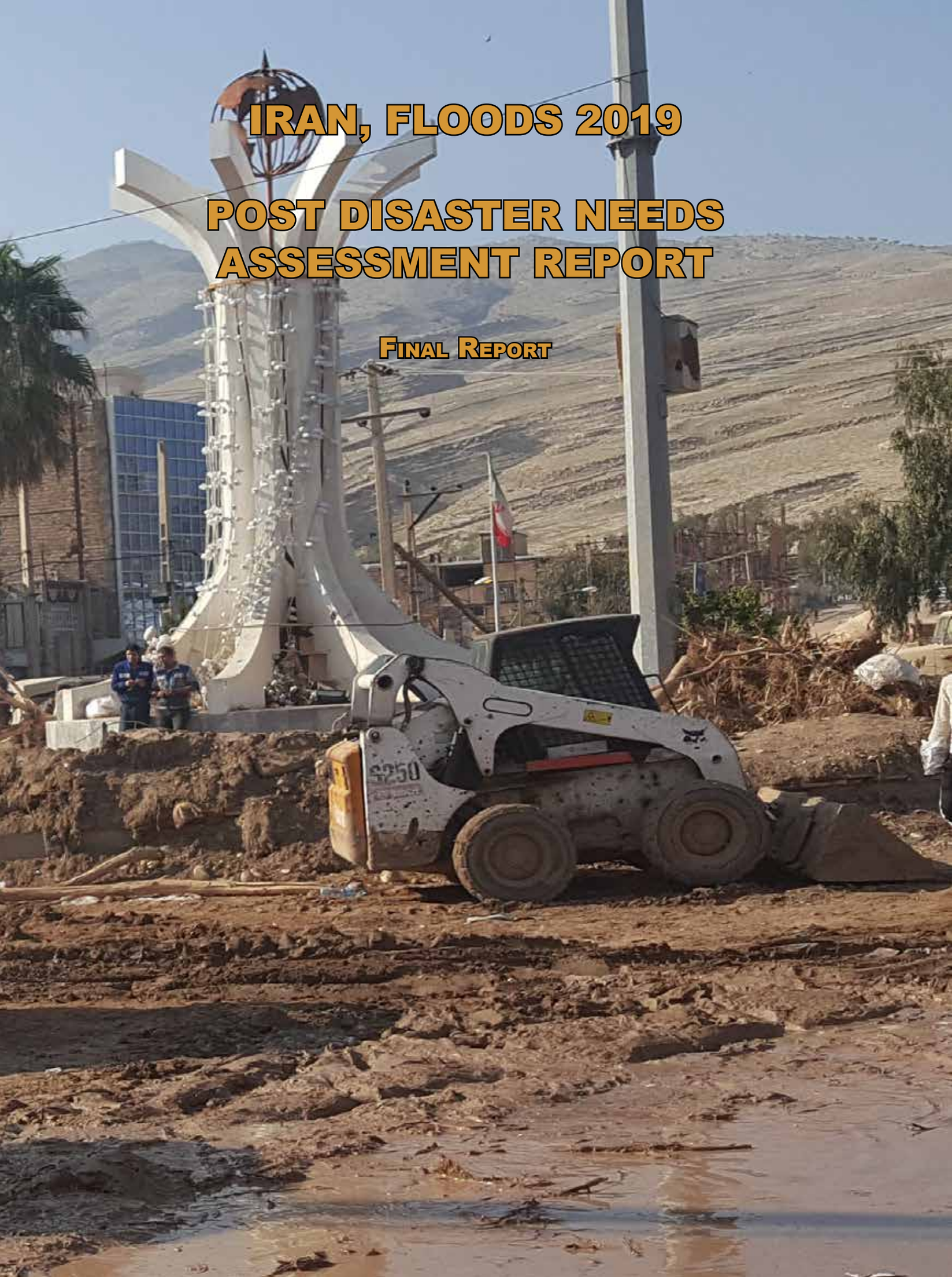


IRAN, FLOODS 2019

POST DISASTER NEEDS ASSESSMENT REPORT

Final Report

1. Introduction

1.1 Background

Following the floods and landslides of April 2019, the Plan and Budget Organization (PBO), Government of Iran commissioned the United Nations (UN) system to conduct a Post Disaster Needs Assessment (PDNA) of the impact of the floods and landslides in three selected provinces of Golestan, Lorestan and Khuzestan. The assessment was led by Government of Iran over a period of six weeks starting from 2nd July to 9th August, 2019. A team of multi-sectoral experts from the UN agencies and national experts conducted the assessment with representatives from relevant line ministries and estimated the damage, loss and recovery needs across 12 sectors.

The assessment included Social Sectors such as Housing, Education, Culture and Tourism; Productive Sectors such as Agriculture, fisheries and livestock; Infrastructure Sectors such as Energy, Transportation, Water, Sanitation and Hygiene, and Community Infrastructure; Cross-Cutting Sectors such as Disaster Risk Reduction, Environment, Employment and Livelihoods, and Gender and Social Inclusion. They present a consolidated view, based on information received from various line departments and the expertise of a multi-institutional and interdisciplinary assessment team.

The estimates of damage, loss and recovery needs are conservative in nature due to the limited data available on the sector damage and loss, and lack of data on loss sustained by the private sector. The total damage and loss of IRR 154,672.22 Billion (USD 1,470.51 Million) and recovery needs estimated at IRR 159,211.82 Billion (USD 1,513.66) in this report reflects only a portion of the overall impact of the floods and landslides. The assessment has also analyzed the economic impact of the disaster on the affected provinces and provides a broad recovery strategy to contribute to the three pillars of government's vision of a "Resilient Economy", "Progress in science and technology" and "Promotion of cultural excellence"[1].

This chapter provides a brief overview of the demographic, social and economic context of Iran; its disaster risk profile as well as the disaster risk management system, followed by a brief description of the spring 2019 floods and its effects, government and humanitarian response to the disaster, and the post disaster needs assessment process followed in Iran that resulted in this report. The final section outlines the structure of the report and its different chapters.

1.2 Iran at a glance

Iran's population is 82.390 million people in 2019, with a growth rate of 1.24% between 2011 and 2016 (SCI[2]); *Life Expectancy* at birth stood at 76 in 2016 - having increased by nearly 21 years between 1980 and 2016; the Human Development Index (HDI) was 0.798 in 2017. Iran's *HDI* value stands as 60th out of 189 countries – having increased by nearly 58% between 1980 and 2017. *Mean Years of Schooling* and *Expected Years of Schooling* have increased by 5.7 years and 6.5 years respectively between 1980 and 2013.

Iran's economy is the second largest in the Middle East and North Africa region and with an estimated national income (net *GNI* at basic current price) that rose from circa 6,000 Trillion IRR in 2012 to circa 10,300 Trillion IRR in 2016 (CBI[3]). Following some years of recession, the Iranian economy recovered in 2014 following the Joint Comprehensive Plan of Action (JCPOA) and expanded by 3%, and inflation declined from average 29% in 2012 to 12% in 2017. However, the US withdrawal from the JCPOA in 2018 and ensuing external factors resulted in oil sales constraints, significant devaluation of the IRR and macro-economic shocks.

In May 2018, the IRR had devalued by 172 percent, rising above IRR 100,000 per dollar in August 2018. This has contributed to the measured inflation rate returning to 24 percent in August 2018, a rate last seen since 2013.[4] In March 2019, inflation stood at 30.6%; estimates for GDP indicate a fall in the growth rate by 3.8%; and unemployment stood at 12% (SCI[5]) with possible further fall in employment. For the first quarter of 2018/19,

1. 6th Five-year Development Plan
2. https://www.amar.org.ir/%D8%AF%D8%A7%D8%AF%D9%87%D9%87%D8%A7-%D9%88-%D8%A7%D8-%B7%D9%84%D8%A7%D8%B9%D8%A7%D8%AA-%D8%A2%D9%85%D8%A7%D8%B1%DB%8C
3. Central Bank of Iran – 1396 Annual Review
4. The World Bank https://www.worldbank.org/en/country/iran/overview
5. SCI as above.

economic growth in Iran continued to slowdown. On the production side, the economy grew by 1.8 percent year-on-year (yoy) in June quarter 2018 substantially lower than growth in the same period a year before (4.6 percent) and heavily relying on the oil sector. In the non-oil sector, growth was still attributed to services (transportation, storage and communication) while manufacturing output declined for the first time in the past 8 quarters (-1.5 percent, yoy). Due to increasing uncertainty in the future direction of the economy, investment shrank (-0.8 percent, yoy).

The central government budget deficit for the first nine months of 2018/19 deteriorated to a record high of IRR 451.1 trillion (equivalent to 4 percent of 2017/18 GDP for the same period), almost 40 percent more than the approved budget for the entire 2018/19 year, mainly due to a 62 percent shortfall in expected current revenues. The fiscal deficit is projected to widen as incomes continue to fall short of the previous years due to lower tax revenues (as a result of reduced economic activity) and oil exports.

In the medium term, the economy is expected to undergo a period of stagflation until April 2020 as oil output continues to decline along with other mounting external economic challenges. The economy is projected to contract by more than 2 percent in 2018/19 and 2019/20 before returning to a modest recovery path albeit from a smaller base. Inflation is expected to be around 30 percent in 2018/19 and increase further in the following year as the full effect of the exchange rate depreciation is passed on.[1]

The unemployment rate remains high, at 12.1 percent as of Apr-Jun 2018, although a moderate improvement for the same period of the previous year. Male and female unemployment rates of 10.2 and 19.7 percent respectively, suggesting a continued gender gap in the labor market. Youth (15-24 years) unemployment at 28.3 percent in June 2018 remains high compared to earlier periods and regional average. The labor force participation rate edged up to 41.1 percent in June quarter 2018, its highest level in more than 10 years. Female labor force participation rate continued to improve to around 19.8 percent in 2017/18, making Iran among the top countries that improved the participation of females in the labor force.[2]

1.3 Disaster Risk Profile of Iran

Geography. Iran is a country in southwest Asia with mountains and deserts. With an area of 1,648,000 square kilometers, Iran ranks eighteenth in size among the countries of the world. Iran shares its northern borders with Armenia, Azerbaijan, and Turkmenistan, and nearly 650 kilometers of water along the southern shore of the Caspian Sea. The other borders are with Turkey in the north and Iraq in the south terminating at the Shatt al-Arab, and the Persian Gulf and Gulf of Oman for about 1,770 kilometers. On the eastern side lie Afghanistan, Turkmenistan on the north and Pakistan on the south.[3]

Climate. The climate of the country can be divided into three main categories:

- Warm temperate, rainy with dry summer in a narrow strip in the north;
- Dry, hot desert in the central plateau; and
- Dry, hot steppe covering the rest of the country.

Apart from the coastal areas, the temperature in Iran is extremely continental. The annual range of temperature difference is great from 22°C to 28°C. Cold winters, especially in the north in the Alborz Mountains are common. The January mean temperature in Mashhad is 2°C and the minimum is -25°C. On the plateau it is less cold than in the Alborz Mountains. In summer hot weather generally prevails, in particular, in the low land area and enclosed valleys such as those of Khuzestan and Lorestan where the daily maximum often exceeds 44°C. Summer temperatures of more than 55°C have been recorded.

Annual precipitation is 680 mm (26.8 in) in the eastern part of the plain and more than 1,700 mm (66.9 in) in the western part. The eastern and central basins are arid, with less than 200 mm (7.9 in) of rain, and have occasional deserts. The coastal plains of the Persian Gulf and Gulf of Oman in southern Iran have mild winters, and very humid and hot summers. The annual precipitation

1. World Bank: Iran's Economic Update - April 2019. https://www.worldbank.org/en/country/iran/publication/economic-update-april-2019
2. The World Bank https://www.worldbank.org/en/country/iran/overview
3. Ali Bakhtiari: Country Report: The Islamic Republic of Iran On Disaster Risk Management: 2014; https://www.adrc.asia/countryreport/IRN/2013/IRN_CR2013B.pdf

ranges from 135 to 355 mm (5.3 to 14.0 in)[1]

Hazards. Iran has a high level of exposure to multiple disaster risks. Situated in one of the most arid regions of the world, it suffers from frequent droughts. Moreover, floods, forest fires and sand and dust storms increasingly affect different parts of the country. Iran's main concern, however, continues to be seismic risk. Due to its particular location in the Alpine-Himalayan mountain system, Iran is highly vulnerable to numerous and often severe earthquakes including landslides, rockslides, rock falls, liquefaction, submarine slides, and subsidence. The Bam earthquake December 26, 2003 (magnitude of 6.6 Mw) was one of several deadly tremors that have repeatedly struck Iran's towns and villages throughout its modern and ancient history. Thirteen years before that (June 21, 1990) an earthquake with a magnitude of 7.7 on the Richter scale hit the North of Iran leaving 40,000 dead, more than 400,000 homeless, 60,000 or more injured. Around 100,000 homes and commercial building were damaged and hundreds of towns and villages destroyed.

The hydro-meteorological hazards associated with the location of Iran include floods, debris and mud flows; thunderstorms, hailstorms, wind storms, blizzards, snow avalanches, and other severe storms including localized strong winds and frost. On the other hand, drought, desertification, wildland fires, heat waves, sand or dust storms are also a threat.[2] Considering the frequency of all type of disasters from 1990-2014, earthquakes occurred 47.2% while floods happened 41.5%. In terms of lives lost, earthquakes took 92% of the total casualties with only 6.5% from floods. However, in terms of economic losses, drought caused 45.5% of the combined losses while earthquake caused 30.4% and floods took 23.7%.[3]

1.4 Disaster Risk Management in Iran

Iran is a country prone to disasters due to its geological setting and geographical characteristics. For instance, the characteristics of rivers and topographic conditions in Iran have great contributions on the extent and intensity of floods in the country. Most of the Iranian rivers are prone to overflow during heavy precipitations in different seasons. Therefore, in order to avoid damage and loss due to overflow of rivers, construction around all rivers (including seasonal rivers) should be controlled and limited to safe places. In addition, most of the rivers in the mountainous areas, pass under deep and narrow valleys. Therefore, during heavy rains, the velocity of water will increase and the floods can be more destructive. This may cause further erosion in river banks and beds and bring huge amounts of deposits towards built environment, dams and other infrastructures constructed along rivers. During recent years, lack of attention to construction along rivers imposed considerable loss and damage during floods.

Moreover, climate change and its adverse effects also contributed in increasing weather related disasters (such as heavy rains and floods) in many countries including Iran. This can be considered as the root of many destructive floods in Iran. In figure 1, the flood frequency during the recent decades in Iran is depicted.

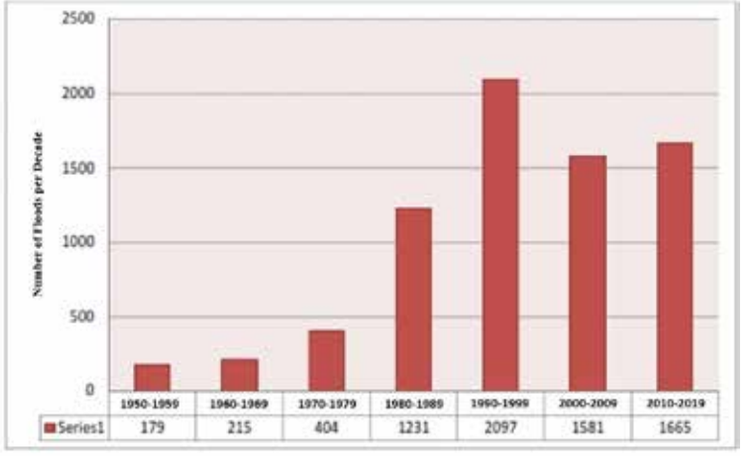


Figure 1: Flood frequency during recent decades in Iran (Ref.: Forests, Range and Watershed Management Organization)

1. NATiONAL REPORT OF THE ISLAMIC REPUBLIC OF IRAN ON DISASTER REDUCTiON World Conference on Disaster Reduction 18th-22nd January 2005: www.unisdr.org/2005/mdgs-drr/national-reports/Iran-report.pdf
2. Country Report : The Islamic Republic of Iran On Disaster Risk Management: Ali Bakhtiari; 2014; https://www.adrc.asia/countryreport/IRN/2013/IRN_CR2013B.pdf
3. PreventionWeb: https://www.preventionweb.net/countries/irn/data/

As shown in this figure, since 1950 more than 7372 minor to major flooding occurred in the country, most frequently during the 90th century.

Based on the report of Forests, Range and Watershed Management Organization of Iran, many parts of the country are exposed to floods. While 28% of total areas of the country are exposed to major floods, the rest may experience other levels of intensity. These include the northern and southern coastal provinces as well as many regions in Fars, Lorestan and Khuzestan (figure 2).

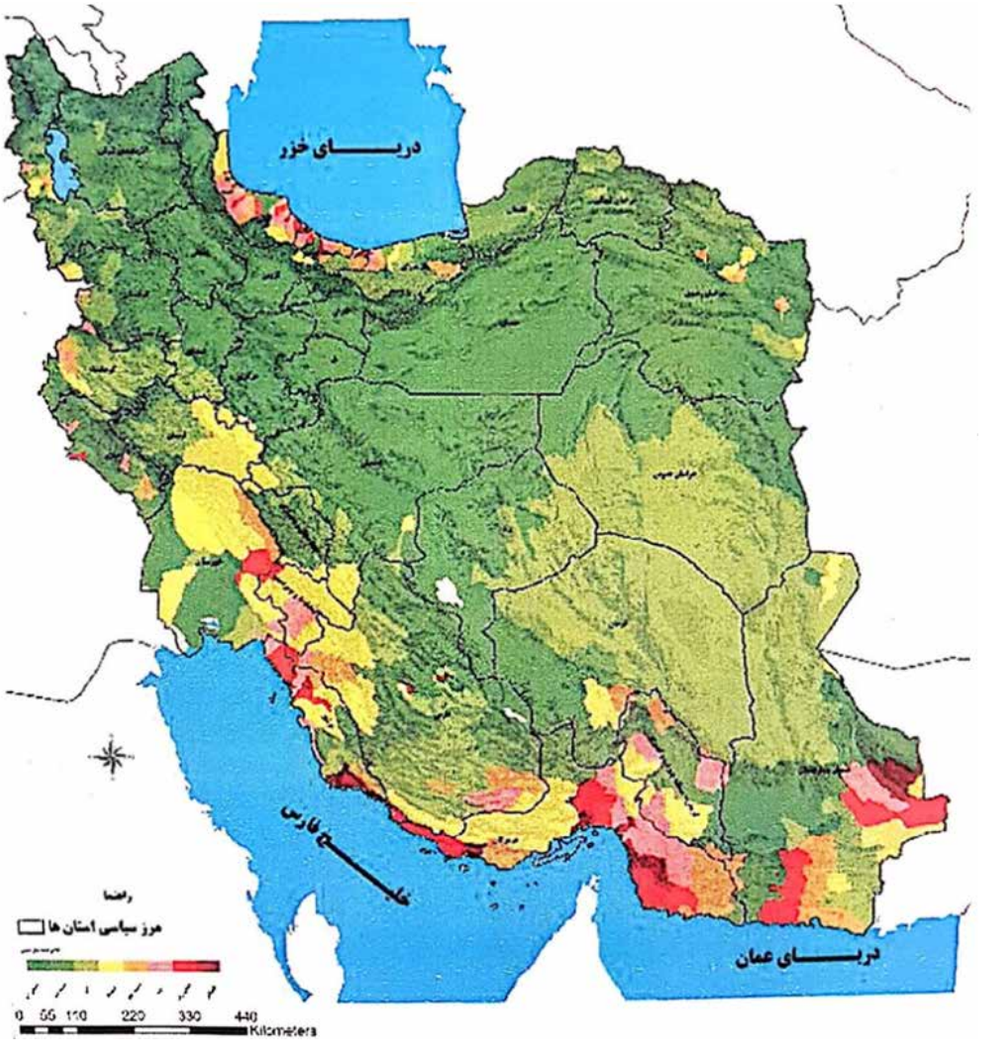


Figure 2: The map of flood risk in Iran (Ref.: Forests, Range and Watershed Management Organization, 2019)

Accordingly, around 55.9 million of Iran population are exposed to floods, amongst them about 15 million people are living in high risk zones. Figure 3 depicts the location of floods occurred in Iran since 1950. Most of them caused considerable loss and damages, specifically those occurred in the Northern provinces. In addition, since 2010 more than 1,600 floods are recorded in Iran, each caused IRR 400 Billion, averagely**.** It should be also mentioned that the damages to the environment by human activities such as deforestation, damages to environmental resources (including pasturelands) and many other negative interventions caused extra risks to settlements due to increasing the natural disasters such as floods.

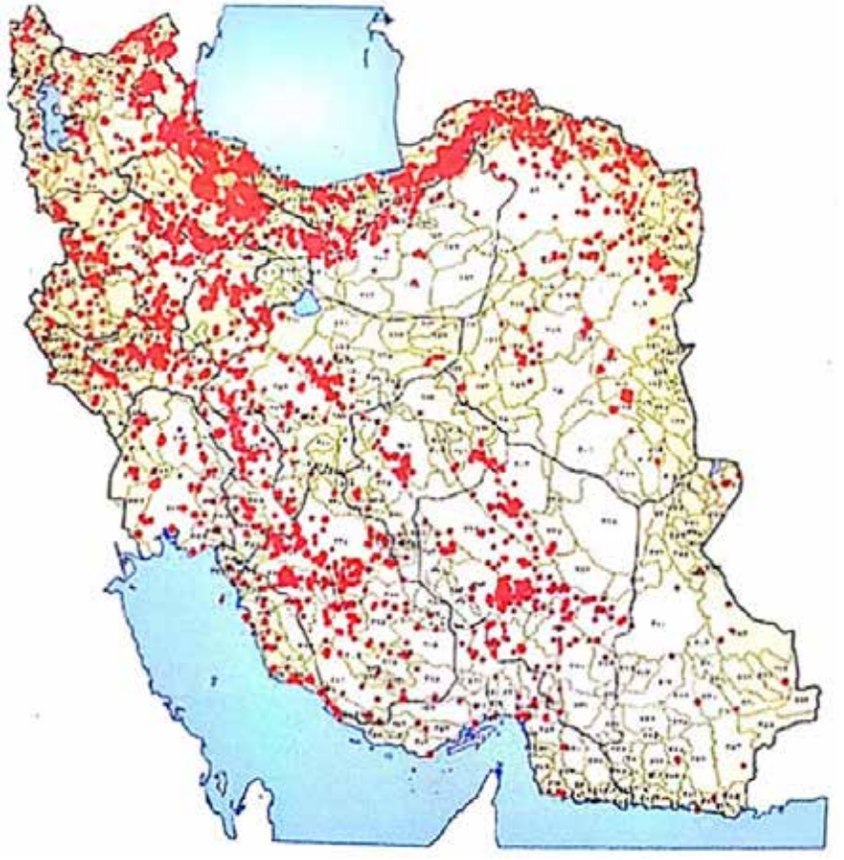


Figure 3: The map of floods occurred in Iran since 1950 (Ref.: Forests, Range and Watershed Management Organization, 2019)

Considering that the occurrences of many types of natural hazards are inevitable, therefore it is important to make necessary measures for risk mitigation and management to reduce their potential impacts. However, in many countries, disaster management is considered equal to emergency response, which means necessary financial and human resources should be allocated to the affected areas by disasters in time. In this approach, gradually after the disaster the level of attention towards the affected areas will be faded (as seen in figure 4), while recovery and reconstruction needs much more physical and non-physical supports. In other word, in emergency phase, both physical and non-physical supports are at the utmost, but aftermath of disaster and during the recovery and reconstruction phase, those supports are gradually decreased.

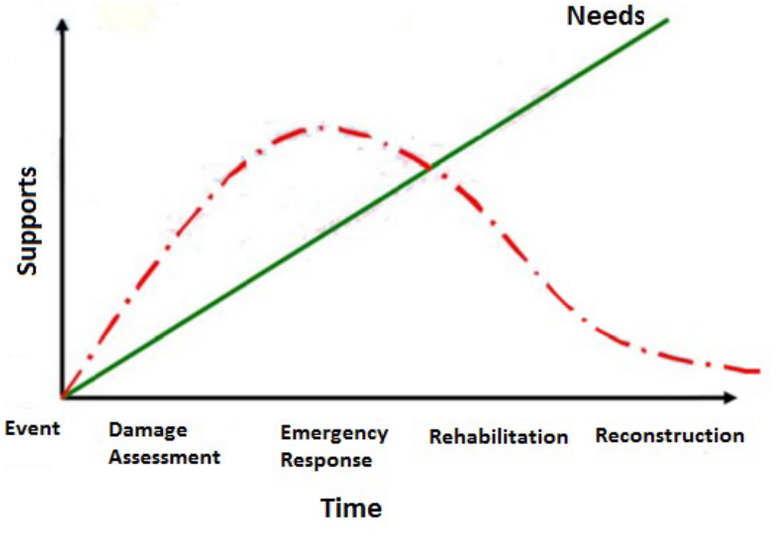


Figure 4: Needs and supports during emergency and recovery phases in developing countries

In the context of disaster management, Iran has relatively a long history. The first law of disaster management (DM) in the country was enacted in 1907 during Qajar Dynasty that assigned the Ministry of Interior as responsible for emergency response. However, perhaps the most important step in improving disaster management system in Iran is related to establishment of the Red Lion and Sun Society (later changed to Iranian Red Crescent Society) in the early decades of last century (1923) by the efforts of Dr. Amir-Alam, during Ahmad Shah era. Dr. Amir-Alam was the president of the society for 17 years and could expand the Red Lion and Sun Society by financial assistance, facilities and supports of the Holy Shrine of Imam Reza (AS) to assist victims in disasters as well as deprived and disabled persons.

Since Iran is considered as a country prone to disasters, the importance of disaster management in the country was significantly considered during recent decades. After the 1962 Boein Zahra Iran earthquake (1962), in 1968, an organization established under the army called as "Committee for Assisting Victims" headed by the commander general of the military forces of Iran. Board members were mainly from the army and Red Lion and Sun Society of Iran. In 1971, approved by the above mentioned committee, the Relief Organization was established under the Red Lion and Sun Society. Later in 1972 the Civil Defense organization was formed in the country to promote preparedness and public safety against natural disasters. This was also responsible for coordination between fire departments in whole the country. Moreover, in 1975, the National Organization for Preparedness and Mobilization of Civilian was created as a subsidiary of the Prime Minister office. However, after Tabas earthquake in 1978 and due to shortages observed in response to the impacts of that disaster, it was proven that the military forces could not provide sufficient disaster management measures in all aspects.

After Islamic revolution in Iran (1979), Committee for Assisting Victims moved to the Prime Minister (PM) office and all DM activities were also defined to be implemented by that office. Moreover, the Civil Defense organization dissolved and its responsibilities were merged into Bassij (a branch of revolutionary guard). This PM office was also responsible to assist the victims of the war of Iraq against Iran and coordination for reconstruction in the damaged parts. In 1990 based on experiences of Manjil, Gilan province, earthquake and also dissolution of Prime Minister position (based on new constitution), responsibilities for disasters and unexpected events were moved to the Ministry of Interior (MoI) in the Taskforce Department of Unexpected Events and Accidents as a part of Civil Affairs Coordinating Deputy of that ministry. Accordingly, all issues related to disaster management were undertaken by that taskforce.

With the approval of the UN General Assembly in 1989, the 90's decade was called as a decade for reducing the effects of natural disasters and new requirements for the member countries were introduced. Accordingly, National Committee for Mitigation of Natural Disasters in the Islamic Republic of Iran was established by approval of the Iranian parliament in 1991. In addition, nine specialized subcommittees were approved and formed by the Cabinet.

Unfortunately, in the years after, some strong earthquakes happened in Iran (such as Ardebil and Ghaen Earthquake of 1997). The challenges of emergency response and recovery in both events depicted the shortages of existing DM structure. Therefore, in formulating the Third Economic, Social and Cultural Development Plan, the Parliament asked the Iranian Red Crescent Society (IRCS) to prepare the Master Plan of Rescue and Relief in cooperation with the Ministry of Defense and Ministry of Interior within one year (article 44 of the plan). The master plan was submitted to the government and approved in March 2003. Based on the plan, it was requested from all relevant agencies to provide necessary executive programs and guidelines and to deliver them to the president office and Taskforce Department of Unexpected Events and Accidents.

Bam earthquake occurred on the fifth of January 2003, while still none of guidelines and executive programs was approved yet. Thus Supreme leader after visiting affected areas in Bam, ordered for establishment a high position command system under the President's responsibility with possible commanding to military forces in times of disasters. This taskforce, called as "Supreme Taskforce for Disaster Mitigation and Management", was established in the President Office in 2004. In addition, in 2005, the general policies of the country in preventing and reducing disaster risks were approved by the Expediency

Council and then ratified by the Supreme Leader of Iran. Those policies, to be obeyed by all governmental and non-governmental institutions, are amongst the most advanced documents ever approved for DM in Iran that cover all aspects from risk assessment, mitigation and preparedness to response and recovery.

In line for those policies, in 2006, the Ministry of Interior proposed a new plan for establishment of Disaster Management Organization as an independent deputy in the ministry to make better coordination and management regarding relevant agencies in different aspects of disaster management. The proposal was approved by the Cabinet (government) at the same year and then submitted to the Parliament. The Parliament and the Guardian Council also approved the law for establishment of National Disaster Management Organization (NDMO) in 2007 to be implemented in five years as a trial period. The plan was extended for several years until the NDMO law was finally approved in 2019, after modification of some articles, specifically those related to the duties of different organizations before to after disasters.

Therefore, according to the existing laws and regulation of I.R. Iran and based on the new Disaster Management (DM) law that have been enacted recently after approval by the Parliament and the Guardian Council, the NDMO headed by the deputy of the MoI is the responsible agency for planning, coordination and supervision of DRR and DRM. According to the organization chart of the NDMO, three deputies of preparedness and response; forecasting and mitigation; and recovery and reconstruction are working directly under the director's authority. Each of those deputies has also some offices as shown in figure 5.

This organization has also different offices in each province to manage relevant activities at all levels, under the authorization of the governor-general. At the city level, the city-governor is reasonable for DRM and DRR, under supervision of the provincial NDMO office. However, different institutions have also some roles and duties in DRR as well as providing necessary services to the population affected by disasters. For this purpose, different committees have been established according to the existing laws and regulations under the NDMO, each headed by relevant institutions. The duties and responsibilities of those institutions are clearly mentioned in the aforementioned laws and its practical guidelines. Figure 6 depicts the hierarchy of disaster management system in Iran.

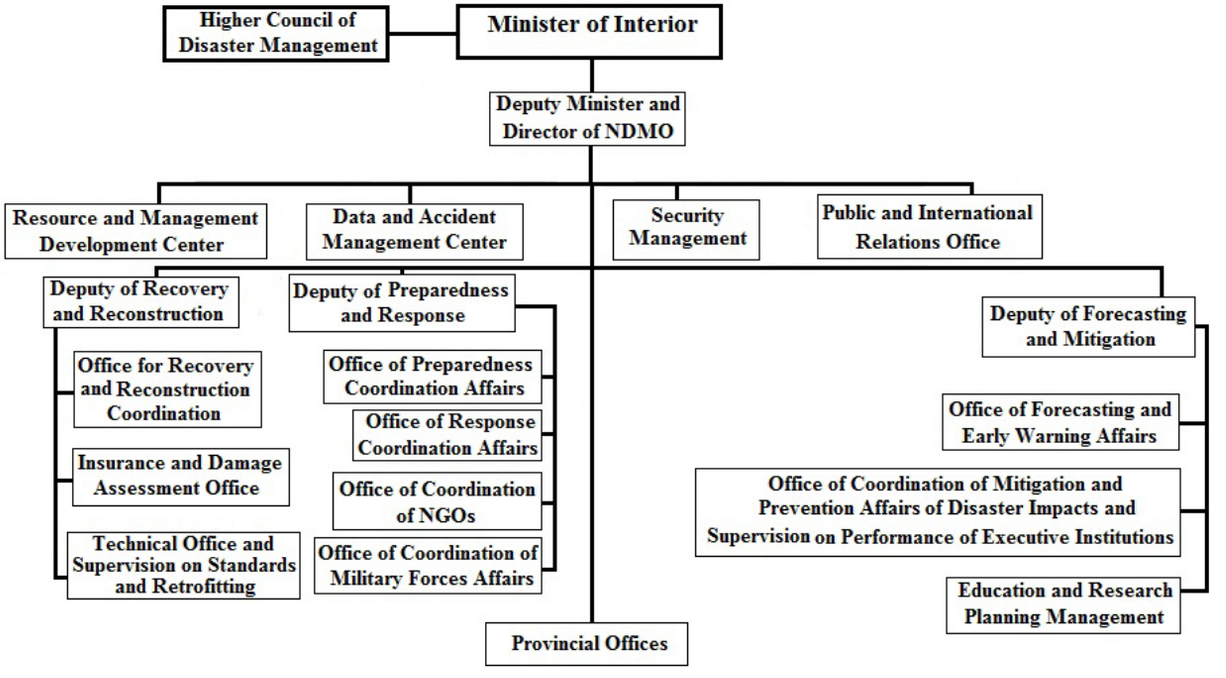


Figure 5: Organization chart of NDMO (Ref.: NDMO webpage)

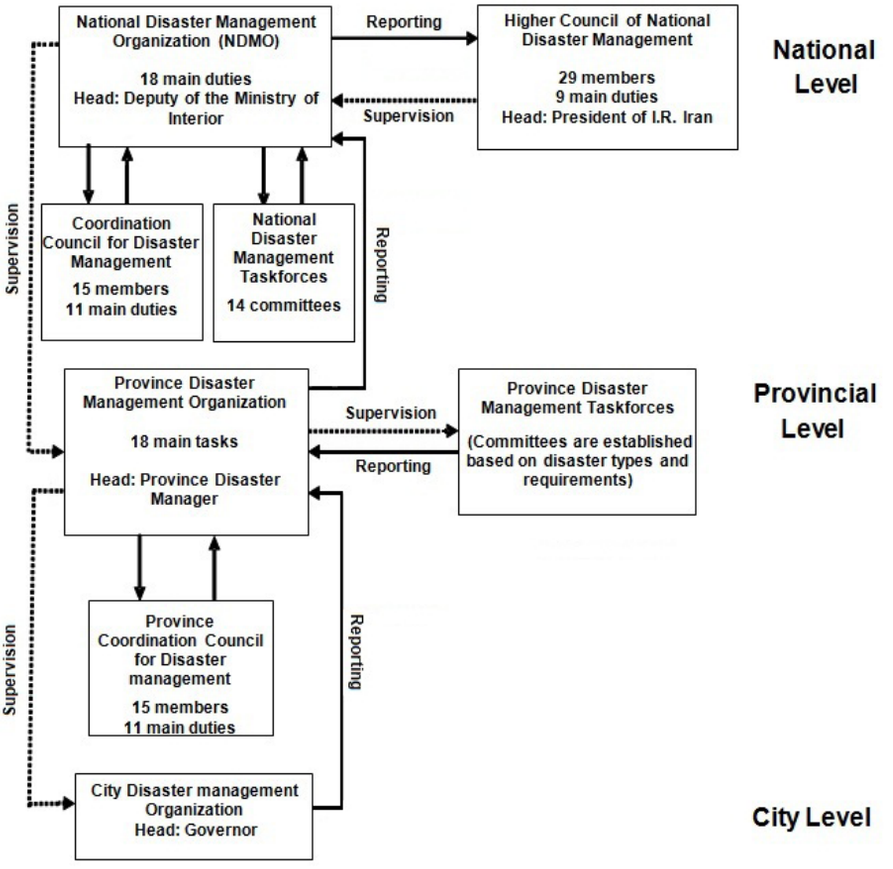


Figure 6. Hierarchy of disaster management system in I.R. Iran

It is worth mentioning that in the recent development plan of Iran (6th Economic, Social and Cultural Development Plan of I.R. Iran, 2017-2021) many direct and indirect articles exist that address DM by some means, including:

- Item 8 of Part (A) in Article 8: Identification of rural areas exposed to natural hazards in order to implement safety intervention plans in the settlements by relevant institutions in cooperation with local institution and people, and to improve at least 30% of at risk villages by the end of this development plan;
- Article 77: The IRCS should provide the following humanitarian services in order to increase safety index and community resilience as well as risk mitigation and reduction measures using annual budget:

1. Providing necessary assistances to conserve and promote social capital, using the capacities and capabilities of people and improving public participation;
2. Developing and strengthening the rescue and relief network in whole the county with the aim to provide mitigation and preparedness measures for in-time and rapid response during disasters and accidents;
3. Promoting public awareness, specifically through public education for risk reduction, and improving resilience of communities against disasters and accidents;
4. In order to provide sustainable resources for response to disasters and accidents, the 0.5% of budget indicated in Article (163) of custom affairs law that was already allocated to the IRCS in its annual budget is increased to 1%.

- Article 78: The government should develop and implement appropriate programs for assuring equity in providing supports to vulnerable population and expanding the necessary measures in relief, support, insurance, mitigation and reduction of social vulnerability.

In the sixth development plan the main targets, strategies, policies and activities on disaster management have been also introduced, as illustrated in tables 1 and 2 (PBO, 2017[1]):

Table 1. Main goals and strategies for disaster management in I.R. Iran

Item	Main Target	Strategies towards Targets
1	Reducing disaster risk	Implementing the disaster mitigation and prevention policies to reduce disaster risk
2	Improving rescue and relief capacities to disasters	Implementing the disaster mitigation and prevention policies to reduce disaster risk
3	Providing rapid response in case of disasters	Promoting effectiveness and performance of rescue and relief interventions in case of disasters
4	Improving the quality of services provided to the survivors of disasters	Improving performance and effectiveness of rescue and relief interventions

Table 2. Main strategies, policies and activities for disaster management in I.R. Iran

Item	Strategy	Policy	Activity
1	Implementing the disaster mitigation and prevention policies to reduce disaster risk	- Promoting public education - Developing professional education for rescue and relief personnel - Improving the resistance of settlements and sites in the country in cooperation with relevant institutions with focus on strengthening buildings and infrastructure - Providing 22 relief items based on the population in different places - Expanding the coverage of rescue and relief centers based on population - Promoting public awareness about mitigation strategies and safe construction - Promoting family reorganization after disasters	- Providing public education to the target community - Providing professional education for rescue and relief personnel - Operating seismic standards and codes in all settlements - Improving distribution of relief items to victims - Developing rescue and relief centers - Assisting comeback of survivors to their families
2	Promoting effectiveness and performance of rescue and relief services in case of disasters	- Improving rescue and relief procedures based on national and international norms - Establishment new rescue and relief centers based on the standards and norms - Organizing sufficient qualified rapid response teams - Providing mental health services (rehabilitation, emergency care, psychological care) - Organizing rescue and relief drills and exercises - Reducing time lags in providing response	- Implementing rescue and relief services based on national and international standards - Implementing rescue and relief operations using rapid response teams - Providing medical care services to the victims - Providing prompt rescue and relief services
3	Providing proper services to the survivors of disasters	- Assuring coverage of rescue and relief centers based on population - Providing 22 relief items based on the population in different places - Implementing rescue and relief services based on national and international standards - Improving quality and quantity of rescue and relief packages	- Improving distribution of relief items to victims - Implementing rescue and relief services based on national and international standards - Commissioning rescue and relief centers based on needs
4	Determining responsible agencies for different disasters	- Assessment of all disasters and hazards in the country - Determining the duties of different institutions in disasters management	- Implementing duties in disaster management by relevant institutions

1. Sixth Economic, Social and Cultural Development Plan of I.R. Iran, 2017-2021, PBO

1.5 Disaster Event

Starting in mid-March, Iran experienced three major waves of rain and floods within a two-week period in what has since been described as a 1-in-100-year event. Record rainfalls occurred with some areas receiving 70% of their annual rainfall in a single day. According to Government officials, 140 rivers burst their banks, leading to flash floods which affected 25 of the 31 provinces. There are entire villages that have no shelters; people who lost access to clean drinking water and could not maintain their usual standards of personal hygiene; families who lost their livelihoods and whose children are unable to attend school. Due to the destruction of public infrastructure, these communities have no access to healthcare facilities which have been totally or partially destroyed. There were not enough facilities to accommodate the 270,000 who have been provided with temporary shelters in public spaces such as undamaged schools, mosques or public centers.[1]

The destruction of infrastructure, private and public property is extensive and widespread. More than 10 million people have been affected, including one million refugees and other foreigners. At least 78 people have lost their lives and about 1,140 people have been injured, according to authorities. It is estimated that about 365,000 people have been displaced because of the flooding. By mid-April, an estimated 2 million people needed humanitarian assistance; about 500,000 of which were women of reproductive age with specific health needs, including an estimated 7,125 women who were pregnant at that point.

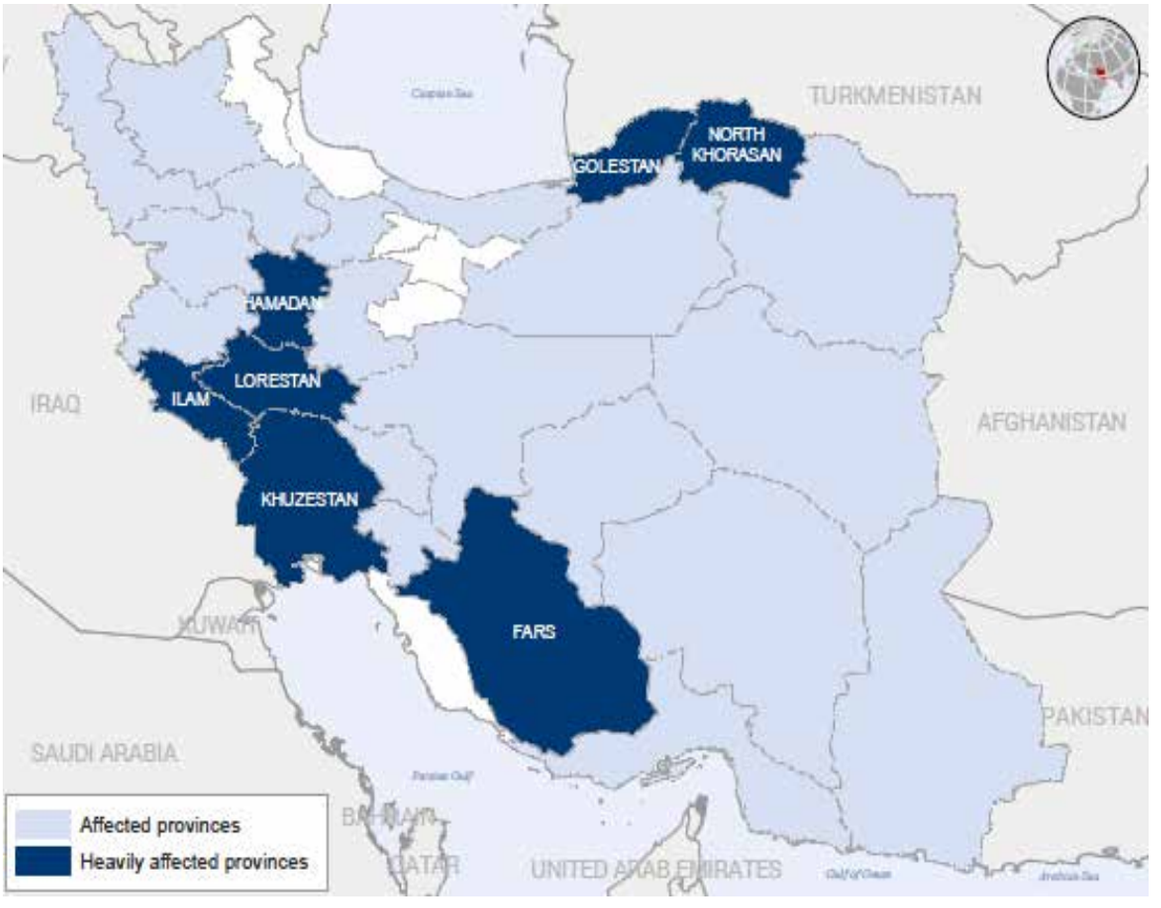


Figure 7: Map of flood-affected provinces of Iran, Source: UNOCHA, I.R. Iran Flood Response Plan, April 2019

1. Source: Norwegian Refugee Council; IRAN FlOODS: RAPID NEEDS ASSESSMENT APRIL 2019 in GOLESTAN, KERMANSHAH, LORESTAN AND KHUZESTAN PROVINCE

Table 3: Province-wise data of population affected by floods and landslides; Source: UNOCHA

SL.	Province	Population affected	Villages Affected (Nos.)	Human Casualty
1.	Golestan	300,000*	500	8
2.	Lorestan	1,100,000**	1800	15
3.	Khuzestan	400,000	300	6
	TOTAL	**1,800,000**	**2600**	**29**

* The number was estimated by using the population of the flood-affected areas which makes it a rough estimation.
** 1,800 villages in Lorestan province were affected by the flood which is near 68% of the total villages in the province. Considering that villages are more flood-prone than cities we could reach to a rough estimation of 1.1 million flood-affected people in Lorestan.

Golestan

Flash floods began on the 19th of March in Golestan province, north east of the country, resulting in the evacuation and displacement of thousands of individuals. Agricultural lands and livelihood assets were destroyed, in addition to damage to public infrastructure (power supply, roads, schools and health centers). Electricity supply was affected, and to a lesser degree, in some locations water became unsuitable for use. Aq Qala and Gomishan areas, downstream from Gonbad settlement have been severely affected. The floods lasted longer; by the 10th of April, several villages and a significant section of Gomishan City were still under water. There are 30,000 Afghan refugees living in Golestan province of whom 3,000 are undocumented. Many of those Afghans were affected and displaced but received first-line emergency assistance.

Lorestan

In Lorestan province, the majority of cities and districts such as Mamulan, Dorud, Khoramabad, Pol-e Dokhtar and Wisiyan were affected by the rainfall. The flow rate of the Khoram Abad River increased from 400 cubic meters per second to 700, while the Tireh River in Dorud experienced a flow rate which increased from 380 cubic meter to 550 cubic meter per second. Although the number of casualties was mitigated through warnings and evacuation of rural and urban areas, the aftermath included 15 fatalities and 256 injuries. Nonetheless, the scale of financial loss is vast and significant as many people had to leave their houses and all their belongings behind.[1]

In Lorestan province, 7 percent of all businesses, that is to say 3,260 businesses, have been damaged, of which 70 percent were located in Pol-e Dokhtar city. Aside from the financial damage in Lorestan, over 46,000 families have been directly affected by the flood. Overall, the flood damage in Golestan, Khuzestan, Mazandaran, and Lorestan provinces has been more than all the other provinces and constitutes 76 percent of all the flood damage.[2]

Khuzestan

Due to heavy rainfall in Zagros Mountains, Dez River and Karkheh River overflowed and water accumulated in Dez Dam and Karkheh Dam with Karkhe dam's reservoir located in Khuzestan province, reaching 8,400m³/sec. As dams reached their maximum capacity, the Ministry of Energy managed to release water. In order to prevent disaster occurrence, the Karkheh Dam, which was near its capacity limit, was opened to discharge excessive water. During the second week of April, about 200 villages had been evacuated, with 46,000 people displaced and living in emergency shelters. In Ahvaz, 110 patients were evacuated from a hospital for mentally ill patients on the 8th of April, according to a government news agency. In total, 6 cities and 210 villages were inundated.[3] Oil output had been reduced in the oil-rich province of Khuzestan, home to the Azadegan and Yadavaran oilfields. Around a dozen oil wells have been shut down because of massive floods, leading to a drop of up 15,000 to 20,000 barrels per day in crude production.[4]

Overall, the flood damage in Golestan, Khuzestan, Mazandaran, and Lorestan provinces has been more than all the other provinces and constitutes 76 percent of all the flood damage.[5]

1. Source: Norwegian Refugee Council; IRAN FlOODS: RAPID NEEDS ASSESSMENT APRIL 2019 in GOLESTAN, KERMANSHAH, LORESTAN AND KHUZESTAN PROVINCE
2. https://iranintl.com/en/iran/flood-damage-iran-initial-report
3. https://www.presstv.com/Detail/2019/04/12/593234/Iran-flood-oil-khuzestan-zanganeh-output; https://en.wikipedia.org/wiki/2019_Iran_floods#Khuzestan
4. https://www.reuters.com/article/us-iran-oil-floods/iran-closes-oil-wells-in-flood-hit-khuzestan-province-output-drops-idUSKCN1RT0YT
5. https://iranintl.com/en/iran/flood-damage-iran-initial-report

1.6 Government and Humanitarian Response[1]

The Government-led response, primarily through (IRCS and local communities, provided assistance to affected people. For the early recovery of the affected families, the Government allocated small cash grants and free-of-charge living facilities to the most affected families.

In Golestan, Government has allocated IRR 4600 billion (USD 41 million) for housing aid. To date, 1926 applicants have received housing grants totaling IRR 71 billion (USD 624,000). The amount is soon expected to reach 100 billion IRR (891,000 USD). Construction of 20,000 housing units has begun in Aq Qala. Also, farmers have received grants worth IRR 140 billion (USD 1,200,000). The Ministry of Education has distributed 52 prefab units for temporary schools and assigned IRR 50 billion (USD 445,780) for the renovation of heating systems of schools which are affected by the floods.

In Lorestan, the Governor initiated unemployment insurance for the people who lost their jobs after the floods in this province. The Governorate's office also employed more than 4,000 people from the affected families for approximately four months for the reconstruction of the damaged houses. Flood-affected households have received grants IRR 160 billion (USD 1.4 million). Four thousand five hundred applications were referred to the banks for additional housing grants, of which 1100 cases have been approved. Isfahan Housing Foundation will reconstruct 4250 housing units in Pol-e Dokhtar. Ardabil Housing foundation will reconstruct 1100 housing units in Lorestan. Also the IRGC will cooperate in the reconstruction process of 250 housing units. The Ministry of Education has distributed 100 prefab units for temporary schools and has assigned IRR 50 billion (USD 445,780) for the renovation of heating systems of schools which are affected by the floods. Government has distributed 24000 educational books in the province. Khuzestan has been allocated an agricultural grant of IRR 9260 billion (USD 82 million) of which half has already been paid according to government sources.[2]

The provinces of Lorestan, Golestan, Khuzestan and Ilam are considered the most severely affected. The UN response plan targeted the 115,000 most vulnerable people for the provision of humanitarian assistance as well as support in early recovery. The total humanitarian response plan is USD 25 million. Those targeted in the response plan are the displaced population within the four provinces, of which 33,325 are in Lorestan, 14,589 in Golestan, 61,000 in Khuzestan, and 6,727 in Ilam.

In four provinces of Mazandaran, Golestan, Khuzestan and Lorestan, the households and commercial units are exempted from Gas bills for 30-45 days. A quota of 5% has been assigned to the flood-affected students competing for bachelors and master degrees' university entrance exams. Also university students can apply for loans.

Within the WASH sector, Relief International and NRC reported that assistance included the distribution of 1,200 hygiene kits in 28 villages of Lorestan, 117 dignity kits in four villages, 227 hygiene kits for children and 500 hygiene kits in Hirmand County in Sistan and Baluchistan province. A total of 2750 people were reached through WASH assistance in the provinces of Golestan, Kermanshah and Baluchistan. Among the planned interventions within the sector is the provision of four sludge pumps in Khuzestan and Golestan. Within the shelter/ NFi sector, NRC will distribute 2,600 kitchen-sets and 2,500 other non-food items starting third week of May 2019 to the province of Lorestan. This in addition to 2,300 cash cards (IRR 15 million each) planned for June in Lorestan.

The Child Protection Sub-sector supported IRCS in training on case management in Pol-e Dokhtar, in Lorestan, targeting members of IRCS Psychosocial Support teams. The objective of this training was to equip participants with skills to identify the most vulnerable people in affected communities, and ensure timely and effective referral. Subsequent to the training, the planned intervention was launched in Pol-e Dokhtar. In addition, UNICEF conducted initial discussions with the MOE for provision of school-based psychosocial support in flood-affected areas.

Aside from the government and UN agencies, as of 14 June 2019, Red Cross and Red Crescent Societies, international humanitarian organizations and private donors within and outside the country provided assistance through in-kind and cash donations. The donors include

1. Source: UN OCHA FlASH UPDATE IRAN dated 15 MAY 2019
2. Source: UN OCHA FlASH UPDATE IRAN dated 01 JUNE 2019

the following: The International Federation of Red Cross and Red Crescent Societies (IFRC); Ministry of Emergency Situations of Armenia; the governments of Russia; Azerbaijan; India; Japan through JICA; the Malaysian Consultative Council of Islamic Organizations; China; Pakistan; Oman; Georgia; Germany through the German Red Cross; Slovakia; UK, Italy, Austria, France, Kuwait; and Switzerland among others.[1]

1.7 Post Disaster Needs Assessment

Assessment process and methodology

The report follows the global methodology for Post Disaster Needs Assessment (PDNA) followed by the World Bank, European Union and United Nations. The methodology is widely used by governments to assess disaster damage, loss and recovery needs. The assessment in Iran started with a two-day orientation of the line ministries and UN agencies to receive an overview of the methodology and adopt the data templates for the assessment to the local context. About 200 government representatives from the affected provinces and line ministries attended the orientation. The following three weeks was allotted to data collection and estimating damage and loss for each sector by province.

A second workshop was organized with the line ministries and UN agencies for the various sectors to draft reports and check on data gaps and address cross sectoral issues. The workshop also provided the platform to discuss the way forward for the recovery and lessons for conducting future assessments. A first draft of the PDNA report was presented to the Plan and Budget Organization (PBO) on 4th August. Following discussions and feedback from PBO, the report was further improved and a final report for endorsement of the line ministries and the PBO was submitted on 15th August.

The Post Disaster Needs Assessment was conducted under the leadership of the PBO, Government of Iran in close collaboration with the National Disaster Management Office, Ministry of Interior, and Government of Iran. The assessment was done by the line ministries, relying on data and estimates from relevant departments and officials from the affected provinces. The UN agencies in Iran supported the respective line ministries in drafting the sector reports, with UNDP facilitating the compilation of the sector reports.

The assessment covers three most affected provinces: Golestan, Lorestan and Khuzestan for 10 of the 13 sectors. However, for Health Sector, due to lack of sufficient data, needs assessment could not be implemented. For the three sectors – Agriculture, Gender and Social Inclusion, and Education, damage and loss data for Khuzestan was not available at the time of the PDNA. Therefore, the recovery needs for Khuzestan province for these three sectors was not estimated. A Terms of Reference defining the geographic scope and sectors to be assessed was decided and endorsed by the PBO. Accordingly, 12 sector teams were formed with representatives of line ministries and UN agencies. The Assessment methodology follows a five step process:

- The collection of pre-disaster baseline data to compare with post-disaster conditions;
- The analysis of the disaster effects with an estimation of Damage and Loss for each sector;
- An assessment of the impacts of the disaster on the sector;
- An estimation of the recovery needs for the sector; and
- A sector recovery strategy proposing appropriate interventions, implementation arrangements, policy recommendations.

In addition to estimating Damage, Loss and Recovery Needs for each sector, the sectors have attempted to integrate four cross cutting issues into the sector assessment. These include gender issues, addressing disaster risks, employment and livelihoods, and environmental sustainability.

Most of the sectors have quantified the damage, loss and recovery needs in monetary terms providing the replacement value for the assets and infrastructure. The loss for all productive sectors of the economy was also estimated, this includes the revenue loss and higher operating costs for public sector services. The values assessed by all the sectors have been aggregated, to arrive at the total cost Damage and Loss for the

1. https://reliefweb.int/report/iran-islamic-republic/int-l-contributions-iranians-flood-hit-people-glance

three flood-affected provinces. In terms of estimating recovery needs, an additional cost for replacement of infrastructure and asset was added based on the costs required to make it disaster resilient.

The additional costs for disaster resilience vary from sector to sector depending on the acceptable levels of "risk" and resources agreed by the relevant ministry/ department as well as for including the principles of building back better in recovery. Care was taken to avoid double or multiple counting in estimating the value of the damage, loss and recovery needs. Furthermore, the aggregated value of damage and loss as well as qualitative information available through various information sources has been used to derive the overall economic impact of the floods at the provincial level. The assessment has also attempted to provide an overarching strategy for guiding flood recovery across all sectors assessed.

Limitations

The estimation of the damage and loss by the Assessment Team is based on the data made available by the various line departments. It must be noted that the data on damage may vary in granularity as the various sectors reflect data collected from the affected provinces within the timeframe of two weeks. The data may not be representative of the entire sector and it was not possible to validate the data through field visits. This assessment presents a consolidated view, based on relevant information received and the expertise of a multi-institutional and interdisciplinary asessment team. It neither supersedes nor disregards the assessments of damage and needs made by other entities.

1.8 Report Outline

The remainder of this Report is organized into six sections as follows:

Section 1: Social Sectors

Chapters 2-4 on Housing, Education, Culture and Tourism. Each chapter provides a brief description of the condition of the sector prior to the floods, the effects of the disaster, viz. damage and loss; recovery strategy and estimated needs; methodology used and references.

Section 2: Productive Sectors

Chapter 5 on Agriculture, Fisheries and Livestock. Each chapter provides a brief description of the condition of the sector prior to the floods, the effects of the disaster, viz. damage and loss; recovery strategy and estimated needs; methodology used and references.

Section 3: Infrastructure Sectors

Chapters 6-9 on Transportation; Energy; Water, Sanitation and Hygiene; and Community Infrastructure Each chapter provides a brief description of the condition of the sector prior to the floods, the effects of the disaster, viz. damage and loss; recovery strategy and estimated needs; methodology used and references.

Section 4: Cross-Cutting Sectors

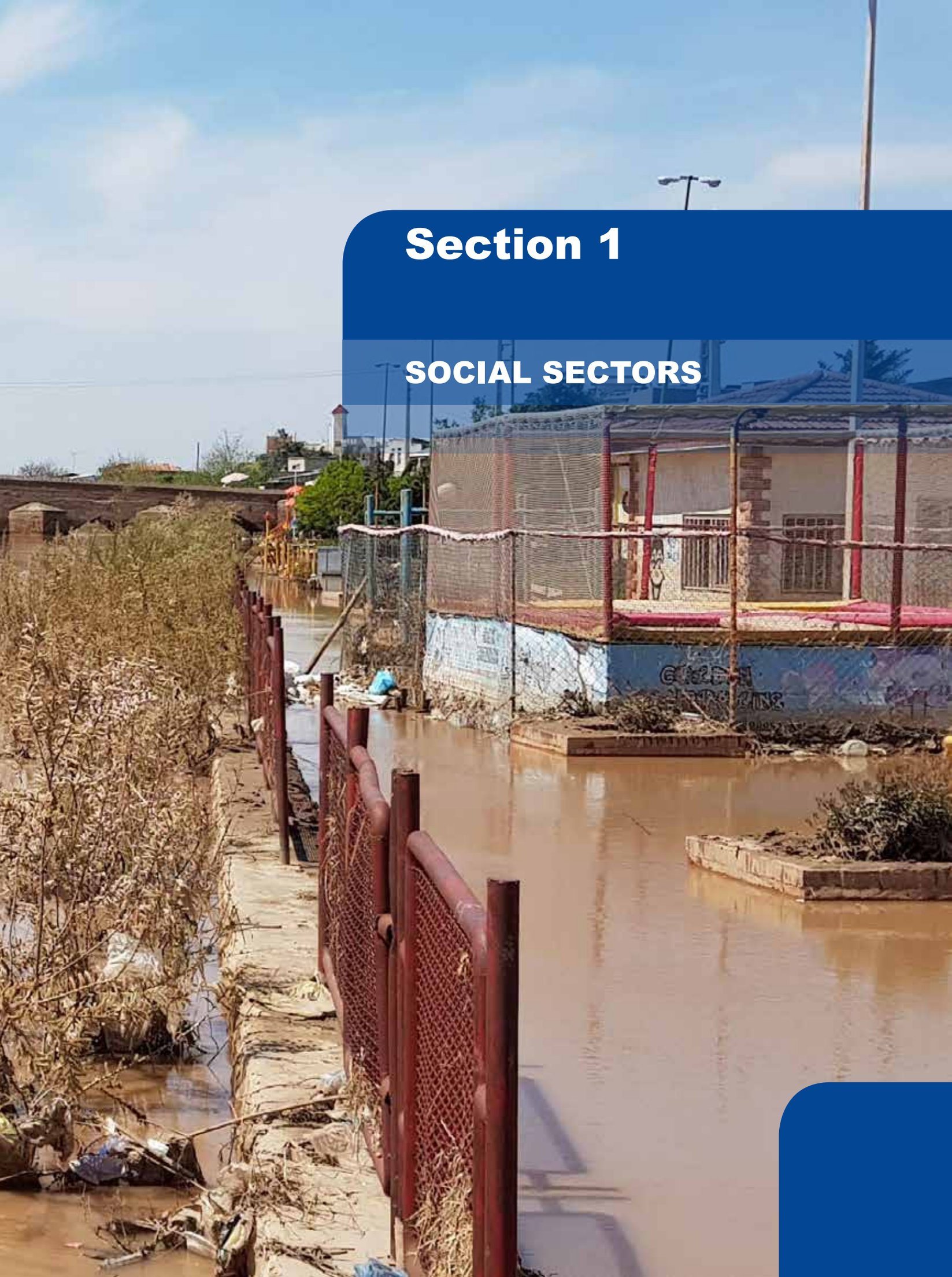
Chapters 10-13 on Disaster Risk Reduction, Environment, Employment and Livelihoods, and Gender and Social Inclusion. Each chapter provides a brief description of the condition of the sector prior to the floods, the effects of the disaster, viz. damage and loss; recovery strategy and estimated needs; methodology used and references.

Section 5: Economic Impact

Chapter 14 on Economic Impact outlines the estimated impact of the disaster on the economy of the assessed provinces.

Section 6: Way Forward

Chapters 15 on Recovery Strategy outlines the overall strategy for recovery, including the additional recommendations for select sectors, followed by steps to translate the strategy into a Recovery Plan along with suggestions for institutional arrangements and financing options.



Section 1

SOCIAL SECTORS

2. Housing

2.1 Summary

This chapter addresses the PDNA in Housing and Settlements sector based on information concerning the 2019 Iran floods. The objective of this report is to provide a clear picture of the outcomes and the impacts of the disaster event on the Housing sector to facilitate decision-making for the recovery and reconstruction of this sector.

Based on a preliminary evaluation by the NDMO on the impacts of floods in Khuzestan, Golestan, and Lorestan provinces, the total economic loss has been estimated around IRR 350 – 400 trillion (about four times more than Kermanshah earthquake of 2017, Mw: 7.3). According to the Housing Foundationdamage survey for the affected areas, a total of 69,149 units of houses were damaged in the three provinces with 16,659 in the Golestan province, 31,810 in Lorestan province and 20,680 in Khuzestan province. The damage ranges from totally destructed houses to repairable housing units. The total damage to the houses is estimated at IRR 43,473.8 Billion equivalent to USD 413.32 million.

The estimated recovery needs for the housing sector is evaluated according to the needs for the reconstruction of the destroyed houses and the repair of partially damaged units. The needs for the reconstruction of a typical new housing unit (80 square meters in average) is estimated about 20 million IRR per square meter (1,600 million IRR for such units). However, for the repair needs, 30 percent of the reconstruction cost per square meter is accounted for an existing typical unit of about 100 meters in average (600 million IRR for such units). An additional 10 percent has been added to the cost of a house as a provision for the Building Back Better (BBB), to build according to disaster resilient features. Due to the high impact of floods on houses, it is critical to address the building standards of housing for ensuring its durability in future disaster events. The total estimated recovery needs for the housing sector is IRR 74,631.04 billion and USD 709.54 million.

The chapter outlines the government assistance for reconstruction of completely damaged houses and repair of the partially damaged houses. As is the practice following disasters, the government will provide grants and loans to house owners for reconstruction and repair. Contractors hired by the government will work together with the house owners in constructing houses. The sector proposes some examples for rapid and resistant construction methods such as 3D wall panel system, light Steel Frames (LSF) method, precast concrete modular units, or insulated Concrete Form (ICF) system.

2.2 Sector Background

The pre-disaster housing data are taken from the national census and post-disaster housing damage data are computed based on the flood exposure data in the three affected provinces, alternatively the national census data will be presented reflecting the affected counties for the three designated provinces in order to get a rough estimate on the pre-event exposure data. The National Census program has collected some general data for the housing and population in 2011 (1390 Iranian calendar) that will be used partially for the baseline information. The National Census program gathers population and building information every 10 years for the entire country; hence, the latest record was published for 2011 and to some extent for 2016. “Population” & “Building” (housing units) data are summarized within provinces, counties, metropolitan areas, and urban and rural settings. The geographic unit that is used reflects the data gathered based on questionnaires for individual housing units. Such information is estimated according to housing units and in the number of resident households rather than individual buildings. According to the 2016 national census, the numbers of women and men practically even out and the total population in the affected zones is 1,868,819, 1,760,649, and 4,710,509 for the Golestan, Lorestan and Khuzestan provinces respectively. The average household population ranges from 3.46 to 3.75 for these cases.

Figure 1 indicates the percentages of the apartment versus non-apartment housing units for three provinces. The total numbers of apartment and non-apartment housing units are 262,962 and 1,559,820 units respectively. The typology of different housing units in the affected counties has been determined according to the Iranian census data of 2011 as summarized in Table 1 (see Annex II for more details). Figure 2 to Figure 4 depict the distribution for different housing typologies concerning building materials and structural

typologies. Because of its low cost (sought by low-income households), the relative simplicity and the availability of local masonry materials and builders, the masonry typology is dominated for these provinces. This is a general case for the rural areas in the country. It is noted that the numbers of steel structures in Lorestan is considerably higher than for other provinces. The major reasons are regarded as: a) after the 2006 Silakhor (Lorestan) earthquake, good quality steel structures with bolts and nuts connections have been promoted and facilitated by the government, b) Steel frame structures could enjoy more architectural flexibility in comparison with the masonry types, and c) this province is well known for its large number of steel workers (nationwide) who have influenced the construction practice.

It is understood that different qualities and vulnerability classes can be associated to each individual structural type because different design and construction methods have been practiced. Steel and Concrete structural types are generally composed of structural frames with infill walls or in some case possess structural walls (rare in the rural area). The Masonry typology comprises of Adobe, all types of brick and cement block masonry with wood or steel members and wooden structures (rare). Traditional masonry or non-engineered steel and concrete buildings are usually performing very poor. Confined masonry, industrial-grade steel and good quality concrete structures exhibit much lower vulnerability.

Table 1: Housing building typology in affected provinces

Province		Steel	Concrete	Masonry	Unknown	Total
Golestan	Total	25781	95336	295861	4021	420999
	Percentage	6.10%	22.60%	70.35%	0.95%	100%
Lorestan	Total	118304	7955	148008	2359	276626
	Percentage	42.70%	2.80%	53.65%	0.85%	100%
Khuzestan	Total	84194	89919	426231	5910	606254
	Percentage	13.80%	14.95%	70.30%	0.95%	100%

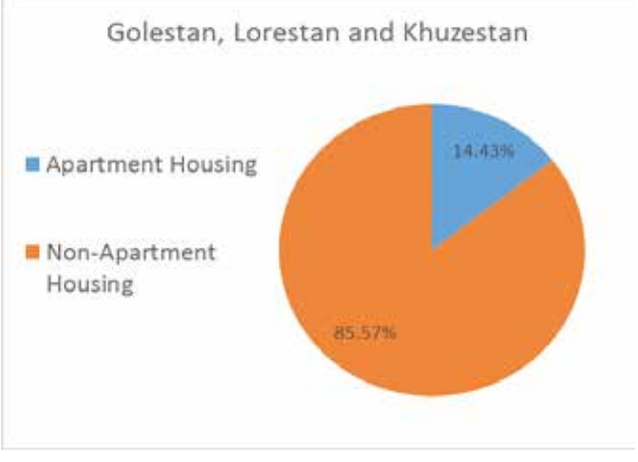


Figure 1. Distribution of apartment and non-apartment housing in Golestan, Lorestan and Khuzestan provinces

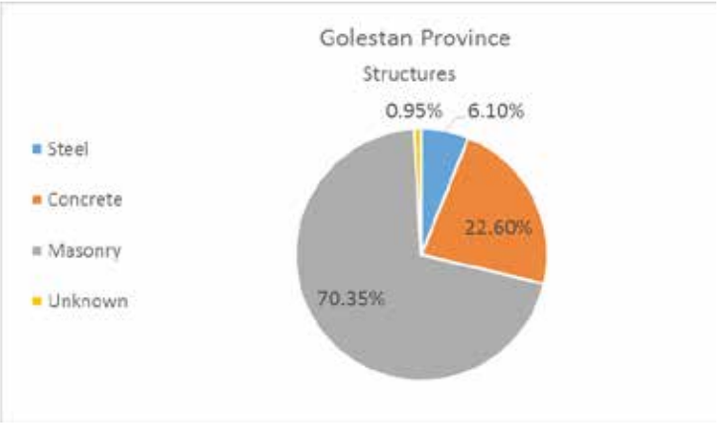


Figure 2. Distribution of housing typology in affected counties in Golestan

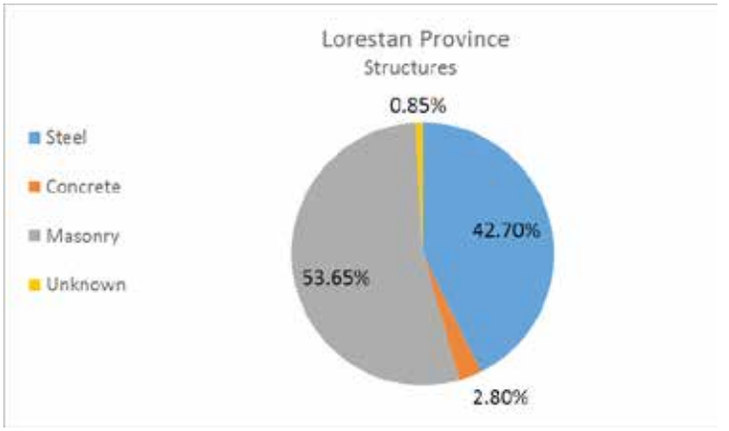


Figure 3. Distribution of housing typology in affected counties in Lorestan

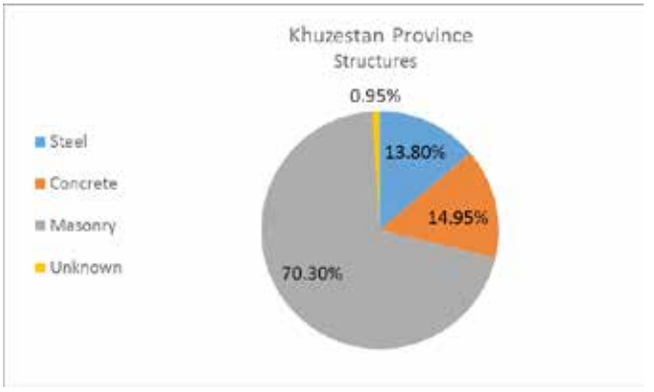


Figure 4. Distribution of housing typology in affected counties in Khuzestan

Existing Practice in Housing Reconstruction

This part describes the existing practice in housing reconstruction concerning disastrous events, including the recent floods. Following a disaster, the country's Housing Foundation is responsible to gather damage data, to assess the level of housing damage by classifying houses for reconstruction or repair, and to estimate the budget needed for the government for essential compensations to the owners in terms of low interest rate loans (i.e. 4% and 5% APR for a 15 years pay off) and non-repayable grants. However, the amount is a partial compensation and the owners need to contribute or seek for other financial resources (including insurance, etc.). TheHousing Foundation also provides technical assistance to the house owners for the purpose of reconstruction (drawings, structural details, designating supervisors, etc...), and oversees the reconstruction process, and facilitates interactions between owners,

providers, contractors and financial institutions (banks, insurance companies, etc.). Namely, no agency is directly responsible for the construction of the houses but the owners.

Based on the information from the National Disaster Management Organization and the Housing Foundation authorities, the amount of financial aid given to each eligible household (with totally damaged houses) covers the initial cost of reconstruction for the core of a family house (mainly the basic structure and not the finishing). The core residential unit is about 75 to 85 square meters that can be expanded over the time with more desired features. At first, it is regarded as a permanent shelter that will be built relatively easily and fast and then converted to a residential house with better features gradually. It is emphasized that the general building typology for reconstruction is categorized as low-rise (1-3 stories) with simple but approved design concept using industrial grade steel frame with bolt and nut connections with brick or cement block infills and walls. Nevertheless; the facades, landscape, and other extra finishing costs are not covered. In many cases an existing damaged single-family house will be planned to accommodate for two or three households up to three stories as needed. Once the general drawings and the number of building stories get finalized, the structural design, usually off-the-shelf structural calculation will be delivered for approval. The process generally takes into account for the soil condition, foundation and the structure. It should be noted that an existing rural single-family house is generally 100 square meters, but considering the financially supported reconstruction, a new housing unit is considered as 80 square meters for the initial reconstruction phase.

A proper step has been taken forward for the promotion and the development of the built environment in a safer manner in line with the enforcement of the practicing building code. As such, low quality and vulnerable structural typologies, such as Adobe or Unconfined Masonry (all types) are prohibited for reconstruction and such damaged buildings will be eliminated and replaced by an approved structural type such as the Confined Masonry, RC or Steel frame construction methods.

Existing Practice for Compensation

This section describes0 the existing practice for compensation concerning disaster events including the recent floods. The government strategy for promoting housing reconstruction is to use pre-approved housing construction methods and acceptable structural systems with engineering details. Usually the reconstruction is completed by a designated contractor. The contractor provides the machinery, equipment, expertise, and hires subcontractors and workers for a fixed amount of money per square meter of the building. Household members usually get involved as work-force with the incentive of speeding up and supervising the process. Moreover, most of the essential materials for the basic construction are provided with the governmental subsidy and wholesale pricing. This brings down the costs of reconstruction substantially.

As a routine practice by the government, once a damaged housing unit is categorized by the Housing Foundation for reconstruction or repair, the owner is entitled for partial financial supports in terms of low interest rate loans of 4% APR for rural and 5% APR for urban areas with a 15 years pay off time and some amounts as non-repayable grants through some designated banks. Basically the loan is gradually supplied as the construction phases complete. According to the Housing Foundation, the total estimated reconstruction cost for the confined masonry (including RC frames) or for the steel frame is about IRR 17 million per square meter with an additional 15% overhead and expenses incurred by the Housing Foundation. The total reconstruction cost will end up to nearly IRR 20 million per square meter. An additional 10% is estimated for the "Building Back Better" concept that could be added to the total estimated costs. The government will not construct the houses, it rather facilitates, manages and supervises the process, and approves low rate loans and some grants to households.

To reduce the costs of housing reconstruction, the government has taken a decision to directly transition from tents (emergency phase) to core housing by cancelling the support for the construction of temporary houses. Instead, another grant is given for renting houses or funds given to host families that will temporarily accommodate the affected people. This grant is IRR 120 million for urban and IRR 60 million for rural settings. However, additional financial help and other types of support may be given by public and private sectors. Table 2 explains the compensation measures for the affected households concerning different levels of coverage for both rural and urban areas.

Table 2: Compensation strategy for damaged housing units and households

Location	Loan 1 (construction)		Grant 1 (construction)		Loan 2 (contents) up to		Grant 2 (contents)		Temporary Housing Grant	
	IRR (million)	USD	IRR (million)	USD	IRR (million)	USD	IRR (million)	USD	IRR (million)	USD
Buildings Entitled for Reconstruction										
Urban Areas	500	4754	120	1141	150	1426	50	475	120	1141
Rural Areas	400	3803	100	951	150	1426	50	475	60	570
Buildings Entitled for Repair										
Urban Areas	150	1426	50	475	150	1426	50	475	NA	NA
Rural Areas	150	1426	50	475	150	1426	50	475	NA	NA

2.3 Assessment of Disaster Effects

The Housing Foundation assessed the damage to housing in two steps. First, right after the event, the damage was estimated through field visit and judged by rapid assessment of the hit areas and a very rough number of the houses was announced. In the second phase, trained field surveyors began assessing each individual house on a door-to-door basis and indicating the levels of physical damages as "totally damaged or totally unsafe", or "requiring repair". The latter is generally described according to two levels of intensity.

Damage

Long-lasting inundation (days and more than a month for some cases) caused severe damages to vulnerable buildings in those places. The inundation level in some areas was more than one meter. Based on the existing reports and information, around 35,000 local residents in urban and rural areas have been affected by recent floods in Khuzestan. In addition, many buildings, infrastructure and industries have been partially or severely damaged. In this province, inundation was the main source of damages. In Ahvaz (especially in Eine-Do), buildings located in the margins of Karun river were inundated and damaged. Similar impacts have been reported in Susangerd and Shadegan.

In some extreme cases, the houses and their lands had been washed by the flood. In many cases the plinths, the foundations and the walls were washed or demolished. For bearing wall masonry structures, the wall collapse resulted in the total collapse. After a rough overall estimate of the affected areas that usually happens in the first few days of the disasters, a more detailed round of investigation took place to determine whether or not a building is repairable utilizing some expert judgments and some instructions.

Table 3 shows the number of the damaged housing units in the affected counties for the three designated provinces, according to the Housing Foundation survey. This information is summarized by the rural and urban areas for the units labeled as repairable, or totally destroyed (i.e. they are to be reconstructed) as well as the number of housing units with building content damages that must be compensated partially for by the government in terms of loans and grants.

Table 3: Surveyed housing unit damage statistics in affected provinces (Housing Foundation 2019)

Number of damaged housing units in the affected provinces - Housing Foundation 2019					
	Reconstruction			Repair	Content
Province	Urban	Rural	Total	Urban & Rural	Urban & Rural
Golestan	1325	6082	7407	9252	8500
Lorestan	1510	11800	13310	18500	20000
Khuzestan	1200	4440	5640	15040	8442
Total			**26357**	**42792**	

Note: Please see Annex II for more descriptive tables

As summarized in Table 4, the monetary damage for the housing units for the affected counties in the three designated provinces has been computed according to the number of damaged housing units. Considering the typical condition, age and the quality of the majority of the existing building stock in the affected areas, a fully damaged house that has been tagged for reconstruction is estimated to have a monetary damage valued around 50 percent of a newly built construction with a basic but acceptable method of construction per each square meter. Overall, a partially damaged house that has been tagged for repair is estimated to account for about 20 percent of the total construction cost (per square meter) of a newly built house with an acceptable construction method. The values in Table 4 have been computed based on i) the consultation with the Housing Foundation officials, ii) the assumed nominal cost of IRR 20 million (190 USD) per square meter for reconstruction according to the current practice of construction for typical housing units, and iii) the presumed nominal 100 square meters for a typical existing single family housing unit (pre-event situation). It should be noted that the damage to the household assets is not included in this table. For a total of 69,149 damaged housing units, 26,357 units were tagged for reconstruction and 42,792 units were tagged for repair; hence, the monetary direct damage has been estimated as IRR 43,473.8 Billion or equivalently 413.32 Million US Dollars. However, the compensation by the government is actually in the form of grant and loan and evenly distributed to the households with damaged units as described and summarized in the following sections (Table 6).

Table 4: Damage of housing units by affected counties in designated provinces

Housing damage by affected counties in designated provinces						
Province	**Reconstruction**		**Repair**		**Total**	
	IRR (Billion)	**USD (Million)**	**IRR (Billion)**	**USD (Million)**	**IRR (Billion)**	**USD (Million)**
Golestan						
Number of Residential Units	7407		9252		16659	
Damage	7407	70.42	3700.8	35.18	11107.8	105.60
Lorestan						
Number of Residential Units	13310		18500		31810	
Damage	13310	126.54	7400	70.35	20710	196.89
Khuzestan						
Number of Residential Units	5640		15040		20680	
Damage	5640	53.62	6016	57.20	11656	110.82
Total Number of Residential Units	26357		42792		69149	
Total	26357	250.58	17117	162.7	43473.8	413.32

Social Impact of Damage

In addition to coping with the immediate impact of the floods that has resulted in building damages and human casualties, the long-lasting inundation caused severe damages to a large number of vulnerable urban and rural settings in those places. The inundation level in some areas was more than one meter. The emergency response has been impaired due to the extent and the severity of the event, and also difficulties accessing the hit areas timely. Considering the large geographic extent of the hit areas, a large number of households could not use their own homes and appliances nor could seek help from the community. A large number of the houses were inundated, filled with mud and rubbles and the contents were practically unusable or contaminated. Such cases were even more dramatic for women that are usually considered responsible for providing food and taking care of children. Specially, the event implied serious threats to the infants, people with disabilities, and elderly. Also, the family economy worsened because of unemployment and business interruption for weeks and months.

2.4 Recovery Strategy & Needs

According to the current reconstruction practice and strategy as mentioned in sections 2.1 and 2.2, an actual existing rural single family house is considered to be about 100 square meters, but according to the current reconstruction strategy by the government that figure have been designated as 80 square meters per household units for constructing the core of a housing unit. However, the family must provide or seek from other sources for extra charges and costs when building footprint expansion or additional features are in mind. Table 5a and Table 5b show the short term recovery needs (18 months) for the housing sector according to the above assumptions. There are no exact information estimates for the mid-term and long-term recovery needs as these needs have not been addressed by the government up to now.

Table 5a. Short term recovery needs (18 months)

Recovery Needs by affected counties in designated provinces						
Province	**Reconstruction**		**Repair**		**Total**	
	IRR (Billion)	**USD (Million)**	**IRR (Billion)**	**USD (Million)**	**IRR (Billion)**	**USD (Million)**
Golestan						
Number of Residential Units	7407		9252		16659	
	11851.2	112.67	5551.2	52.78	17402.4	165.45
Lorestan						
Number of Residential Units	13310		18500		31810	
	21296	202.47	11100	105.53	32396	308.00
Khuzestan						
Number of Residential Units	5640		15040		20680	
	9024	85.79	9024	85.79	18048	171.59
Total Number of Residential Units	26357		42792		69149	
Total	42171.2	400.93	25675.2	244.10	67846.4	645.04

Table 5b. Summarized Short Term Recovery Needs (18 months)

Type of Housing	Program of Activity	Value		Responsible Agency
		IRR (billion)	USD (million)	
Single family houses, expandable up to three stories for rural development upon needs. Nominal building types are confined masonry or steel frame with infill walls	Fast track - Permanent housing including repair and reconstruction	**67846.4** (25675.20 for repair and 42171.20 for reconstruction)	**645.03** (244.10 for repair and 400.93 for reconstruction)	Government (loans and grants) In addition to Tenant and financial grants from NGOs or other financial means
	Provision for Building Back Better (BBB) concept estimated as 10%	**6784.64**	**64.50**	Tenant and financial grants from NGOs or other financial means
Total		**74631.04**	**709.53**	

Table 5b suggests the estimated recovery needs for the short term (18 months) for the housing sector, considering the fact that each new single-family unit construction is about 80 meters square in average and the construction cost is estimated about IRR 20 million per square meters. For the repairable housing units, 30 percent of this unit value is assumed. Moreover, as a provision for the Building Back Better (BBB) concept, an additional 10% has been added to reflect to final recovery needs for the housing sector.

Table 6 indicates the budgeted compensation for damaged housing units and households for the affected people in the region that is computed based on the damage data as surveyed after the events, categorizing the damage data according to different levels of damage (repair or reconstruction), the content damage compensation, and the amount of compensation targeted for each individual cases as described in section 2.2.

Table 6: Budgeted compensation for affected households (Housing Foundation)

Budgeted compensation estimation for damaged housing units by Building Foundation										
Provinces	Reconstruction						Repair		Content	
	Urban		Rural		Total		Urban & Rural		Urban & Rural	
	Housing Units		Housing Units		Housing Units		Housing Units		Housing Units	
	Rial (Billion)	USD (Million)	Rial (Billion)	USD (Million)	Rial (Billion)	USD (Million)	Rial (Billion)	USD (Million)	Rial (Billion)	USD (Million)
Golestan	1325		6082		7407		9252		8500	
	662.50	6.30	2432.80	23.13	3095.30	29.43	1387.80	13.19	1275.00	12.12
Lorestan	1510		11800		13310		18500		20000	
	755.00	7.18	4720.00	44.87	5475.00	52.05	2775.00	26.38	3000.00	28.52
Khuzestan	1200		4440		5640		15040		8442	
	600.00	5.70	1776.00	16.88	2376.00	22.59	2256.00	21.45	12663.00	120.39
Total	2017.50	19.18	8928.80	84.89	10946.30	104.07	6418.80	61.03	16938.00	161.03
Grand Total (million USD)	326.13									

Generally, both urban and rural settlements have been developed over the time with minimal provisions to withstand important natural hazards, such as earthquakes and flood hazards. Considering limited resources and the lack of proper provisions for extreme cases, storing or providing pre-made shelters are often absent from the official government records and have not been accounted for in the recovery plans. Therefore, upon a disaster situation, the lack of such shelter is crucial and affects the lives of the people to a great extent. For disaster situations, basic shelters and temporary housing are regarded as rapid and relatively lower cost solution. Usually tents are a primitive, inconvenient and very low-cost solution for such situations, but can be distributed easily/rapidly to individual people or set as tent sites in elevated safer zone for flood. Next solution has been considered as light container cabins as they are still relatively cheap and easily transportable, but they are weak, damageable, very vulnerable and susceptible to winds and floods and do not last long. As such many consider them as a waste of resources. Nevertheless, such shelters, regardless of the quality, are usually kept and used while affecting the appearance of the urban/ rural settings.

In the 2003 Bam earthquake, in addition to providing tents for rapid/emergency housing, temporary camps and individual shelters were provided by the means of supplying transportable lightweight container cabins. Similar shelters and camps were also set up for the 2017 Sarpol-e-Zahab earthquake. Based on some crucial inflicted social issues and some severe psychological effects and also considering the fact that such temporary constructions have low durability, vulnerable to winds, floods, etc. they are now considered as waste of resources and practically omitted for disastrous situation. Instead, the concept of quick transition from emergency shelters to the permanent housing has been motivated, focusing on the rapid reconstruction of the expandable core housing. However, this is a complex subject; on the one hand bypassing temporary housing may impose some serious issues and hardships for the survivors, but on the other hand living in tents for longtime may cause social challenges and health issues (as the latter was observed in Silakhor earthquake of 2006).

Recently, some good solutions have been provided for rapid housing; i.e. using environment friendly, safe and durable materials which are suited for multi-hazard (earthquake, flood, fire, severe winds) situations. As briefly presented in Annex III, some good examples for rapid and resistant construction methods are presented such as the 3D wall panel system, Light Steel Frames method, precast concrete modular units or using Insulated Concrete Form (ICF) system. The 3D panel method consists of polystyrene foam wall panels as a core with steel meshes on each side to be interconnected together and to be sprayed by cement mortar to form a composite structure. The LSF (Light Steel Frame) structural system is a cage made of light rolled steel profiles as assembled together with nearly spaced vertical, horizontal and braced elements while cement board planks confine and connect the framing. The precast concrete boxed modular system is basically in the shape of inter-connecting box-shaped prefabricated reinforced concrete structures that can be adopted for temporary housing or permanent housing. ICF utilizes polystyrene blocks as the concrete mold where steel reinforcement is inserted inside then poured with concrete. These methods for construction can be compared according to their levels of simplicity, required skills and equipment at the site and rapidity.

Floods (or other extreme events such as earthquakes) and inundation can severely affect the habitability of buildings. The affected residents may need alternative short-term lodging provided by family and friends, or by renting. Usually, affected households need short-term shelters that are provided by the government, relief organizations, IRCS, NGOs, charities, and independent groups of people. When the repair of damaged buildings takes time (a few weeks), other alternative housing can be considered, such as providing mobile homes (light container cabins), staying in vacant available units, or migrating to other areas. Another solution can be handing over the repair or the reconstruction of the damaged houses to either private or public sectors. The number of people that need short-term public shelters is of great importance for the emergency response/management authorities and organizations. On the other hand, the long-term issues concerning housing/building stock are of important challenges for the local governments at the city or county levels.

RECOMMENDATiON:

Given the large scale damage to houses in the floods, it is recommended that the government bans/restricts all construction in the flood plains and areas prone to landslides.

Many villages have suffered severely by landslide/ mudslide and 40 villages are under ongoing slope stabilization studies for the three provinces. For these sites, the tenant will not get any financial aid for the reconstruction until the studies are completed and construction activities are cleared for. In some instances, the villages must be relocated, and the tenants are asked to look for suitable land location. Once the new settlement gets the approval; the financial aid will become available. A recommendation that can facilitate this issue is to have a national plan to develop, expand and build new rural sites according to the current social, environmental (including energy conservation and green technology) and economic needs with the provisions of multi-hazard mitigation measures.

In distribution of resources for housing, it is recommended that a more equitable approach in allocating resources be made based on the level of income, the poverty level or the social status of the people. For example, people below the poverty line, people with disabilities and women headed households could be prioritized in receiving housing assistance first.

In summary, a proper disaster assisted housing scheme will address the following:

- Considering equitable approach for distributing resources including financial aids;
- Developing and accommodating for multi-hazard approach;
- Establishing new settlements in safer locations, when appropriate;
- Accommodating for people with disabilities;
- Accommodating for women headed households by paying special attention to their responsibilities as care takers;
- Considering resiliency, sustainability and environmental efficiency in the new development reconstruction plan.
- Involving the local community, industries, and tenants in construction and development processes in order to augment the economy and enhance skills and abilities.

2.5 Assessment Methodology

The PDNA builds on the development of pre-event exposure database, information concerning the emergency phase and any relevant field surveys. Therefore, the task generally focuses on the baseline information, disaster effects, disaster impact, the recovery strategy and the recovery initiatives. The description of housing and settlement characteristics is mandatory for the purpose of comparing pre- and post-event situation for each area of interest. The current building stock and the population information was drawn from the national census data. The damage data have been taken from the Housing Foundation. In order to calculate the damage, the aforementioned information was combined along with the unit construction price for a nominal building typology.

Data sheets on the baseline information on housing and data on damage were developed with learning from PDNA in other countries and contextualized with inputs from some experts, round table discussions and brainstorming sessions. The data sheets were designed in Excel format (Annex I) to be disseminated, completed and finally added to the database system. The relevant organizations were identified and within a two-day workshop the responsibilities were assigned. For the housing sector, the Ministry of Roads and Urban Development was the focal point for requesting the data, and the Housing Foundation was recognized as the only pre- and post-event data provider to the Management and Planning Organization (MPO). The forms were shared with relevant institutions to be filled out and to be returned for analyzing. However, it was observed that many critical data have not been collected appropriately for the event. Moreover, it was realized that a lot of datasets were not shared due to security issues or because data collection required too much time and effort from the related organizations.

In addition to acquiring official data from the designated authorities, in order to fill the data on housing, some additional published data were gathered from

different sources such as media or other public channels and narratives. However, for the pre-disaster baseline information and to calculate for the housing norms, the data from the Iranian Census Center and the damage data of the Housing Foundation have been utilized.

Based on collected information and studying the best practices worldwide, some recommendations have been proposed for recovery and reconstruction in different terms.

The monetary damage is mentioned and summarized in Table 4 for the damaged housing units in the affected counties within the three designated provinces. Considering the typical condition, age and the quality of the majority of the existing building stock in the affected areas, a fully damaged house is considered to have a monetary damage valued around 50 percent of a newly built construction with a basic but acceptable method of construction per square meters. Overall, a partially damaged house is estimated to account for about 20 percent of the total construction cost of the house with the acceptable construction method. The values in Table 1 have been computed based on the consultation with the Housing Foundation officials and assuming a nominal cost of IRR 20 million per square meters for reconstruction according to the current practice for the construction of typical housing units and also considering a nominal 100 square meters for a typical existing single family housing unit (pre-event situation).

The estimated recovery needs for the short term (one year) for the housing sector takes into account that i) each new single-family unit construction is about 80 square meters square, in average, and ii) the construction cost is estimated to be about IRR 20 million per square meter. For the repairable housing units, 30 percent of this unit value is assumed.

However, the compensation by the government is actually in the form of grant and loan and evenly distributed to the households with damaged units as described and summarized in the proper sections.

3. Education

3.1 Summary

The education sector encompasses all educational services and facilities that serve students from kindergarden to university. The Ministry of Education was not involved in this PDNA process; therefore, the collected data are limited to K-12.

The plan was to follow Inter-agency Network for Education in Emergencies (INEE) standards and assess damage and loss in the 4 areas of access and educational spaces, teaching and learning, teachers and other education personnel, and educational policies. But due to limited engagement from the Ministry of Education, most of the data collected focused on educational facilities.

In the 2018-2019 academic year, 14,323 schools were operational in Golestan, Lorestan and Khuzestan provinces with a total of 1,523,283 students in primary and secondary levels.

Based on the data received from the School Renovation Organization, 882 schools were affected by the floods in the three provinces. The partial or complete destruction of 882 schools has resulted in IRR 2,503 billion of damage, which includes damages to facilities and equipment. The combined loss of the education sector is IRR 106.50 billion which includes the cost of clean up, provision of temporary classrooms, and additional expenses to ensure that schools are ready in time for the new academic year that starts in September.

School closures have resulted in missed days for up to a month in parts of the affected areas. In some occassions, the schools that were not damaged by the floods were used as shelters and therefore closed to students. School closures resulted in exam cancellation or delay causing significant disruption, especially for students who were graduating.

While schools reconstruction has already started in all provinces, the Ministry of Education needs financial support for complete construction and rehabilitation of schools. Students need remedial classes for the missed school days, and students in the last year of secondary school might need extra support to make sure their future prospect for university entrance exams are not hindered.

Province	% share of damage and loss
Golestan	37
Lorestan	63
Total	100

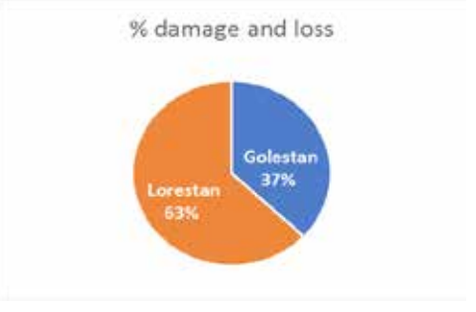


Figure 1. Distribution of damages and losses in Golestan and Lorestan

Table 1: Total damage and loss

Provinces	Total Damage and Loss: Education					
	Damage IRR (B)	Damage USD (M)	Loss IRR (B)	Loss USD (M)	Total Effect (Damage+Loss) IRR (B)	Total Effect (Damage+Loss) USD(M)
Golestan	940.83	8.94	25.50	0.24	966.33	9.19
Lorestan	1,563.01	14.86	81.00	0.77	1,644.01	15.63
Total	2,503.84	23.80	106.50	1.01	2,610.33	24.82

It is important to note that due to lack of access to data and the absense of relevant ministries from the process, the data collected for this report only includes government facilities at the primary and secondary level.

The recovery needs according to the School Renovation Organization include clean up of debris (completed),

reconstruction of schools (ongoing), purchase and distribution of educational materials (ongoing) and provision of temporary shelters for classrooms. All these activities are planned to be completed in the next 18 months and therefore are considered short-term plans. The overall recovery needs is IRR 2,915.87 billion (USD 27.72 million) out of which IRR 605 billion (USD 5.75 million) remains unfunded.

3.2 Sector Background

The table below summarizes the pre-disaster data on educational facilities and number of students served in each province broken down by gender, level of schooling, and type of school (public and private).[1]

It should be noted that the damage and loss data collected for this report only comes from primary and secondary public schools in Golestand and Lorestan and does not include pre-school, higher education and private sector. There are also no data collected for Khuzestan province.

Table 2: Status of Educational Facilities in Golestan Province prior to 2019 floods

Name of Province:	Golestan				
Type of Facilities	Number		Total	Average Number of Students	
Educational Facilities	Public	Private		Public	
				Male	Female
Kindergarten/ pre-school	32	430	462	**264**	**316**
Primary School	1130	211	1341	**82,919**	**81,425**
Lower Secondary Schools	588	62	650	**33,255**	**31,855**
Upper Secondary School	208	57	265	**20,898**	**19,796**
Vocational Training (secondary)	132	12	144	**5,628**	**3,638**
Technical Training (secondary)	45	6	51	**3,866**	**2,190**
University*	14	15	29	Not available	Not available
Technical institutes**	24	1032	1056	Not available	Not available
TOTAL	2173	1825	3998	**146,830**	**139,220**

* The student data is taken from the annual statistics book of 2016-2017

** Data from University Reference of Iran website: https://www.uniref.ir

1. The student data is taken from the annual statistics book of 2016-2017

Table 3: Status of Educational Facilities in Lorestan Province prior to 2019 floods

Name of Province:	Lorestan				
Type of Facilities	**Number**		**Total**	**Average Number of Students**	
Educational Facilities	**Public**	**Private**		**Public**	
				Male	**Female**
Kindergarten/ pre-school	3	234	237	**416**	**324**
Primary School	2548	234	2782	**77,609**	**76,266**
Lower Secondary school	658	72	730	**34,259**	**32,420**
Upper Secondary School	327	88	415	**22,763**	**21,336**
Vocational Training (secondary)	86	23	109	**3,548**	**2,149**
Technical training (secondary)	46	5	51	**3,817**	**1,412**
University	13	6	19	Not available	Not available
Technical institutes (adults)	23	1232	1255	Not available	Not available
TOTAL	3704	1894	5598	**142,412**	**133,907**

Table 4: Status of Educational Facilities in Khuzestan Province prior to 2019 floods

Name of Province:	Khuzestan				
Type of Facilities	**Number**		**Total**	**Average Number of Students**	
Educational Facilities	**Public**	**Private**		**Public**	
				Male	**Female**
Kindergarten/ pre-school	486	1399	1885	**3,077**	**2,543**
Primary School	4177	453	4630	**245,953**	**242,773**
Lower Secondary School	1462	156	1618	**100,492**	**93,668**
Upper Secondary School	711	132	843	**63,432**	**63,765**
Vocational Training (secondary)	185	83	268	**15,147**	**8,056**
Technical training (secondary)	91	14	105	**9,799**	**3,589**
University	52	18	70	Not available	Not available
Technical institutes (adults)	55	1914	1969	Not available	Not available
TOTAL	7219	4169	11388	**437900**	**414394**

3.3 Assessment of Disaster Effects

Damage

Due to the absence of the Ministry of Education from the PDNA process, this report has been compiled based only on the data received from the Organization for Renovation of Schools.

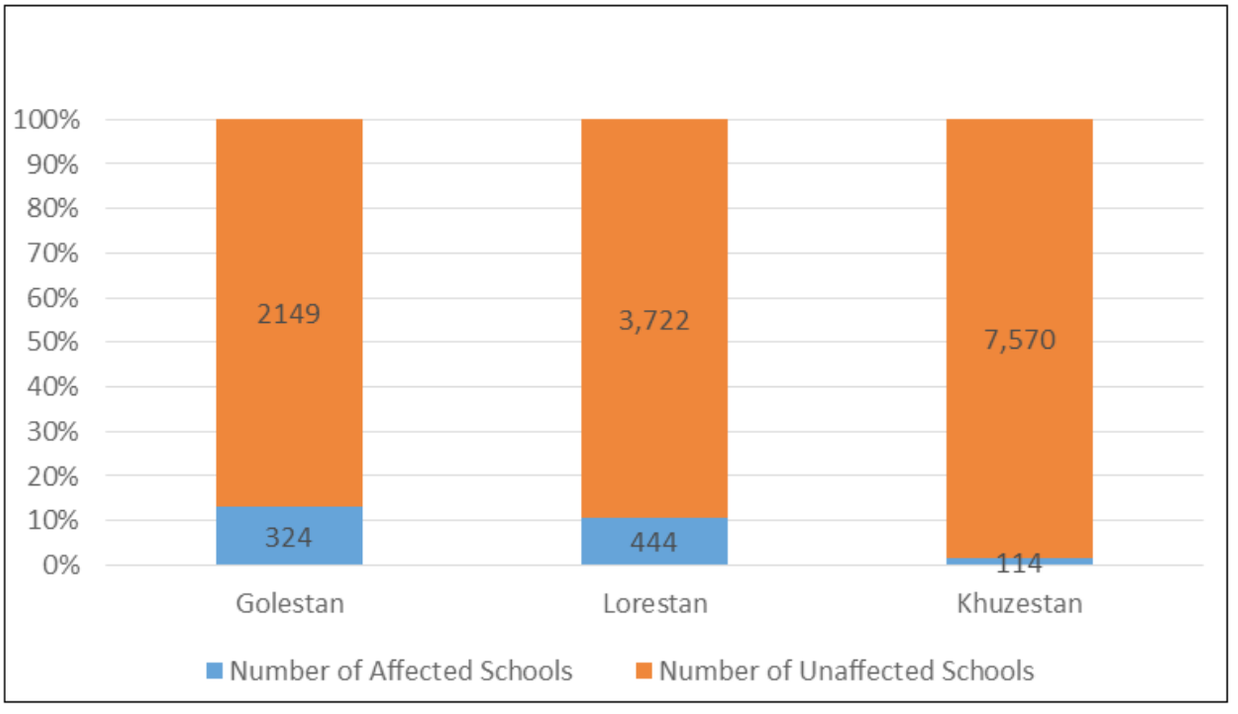


Figure 2. Proportion of affected schools to the whole number of schools by province

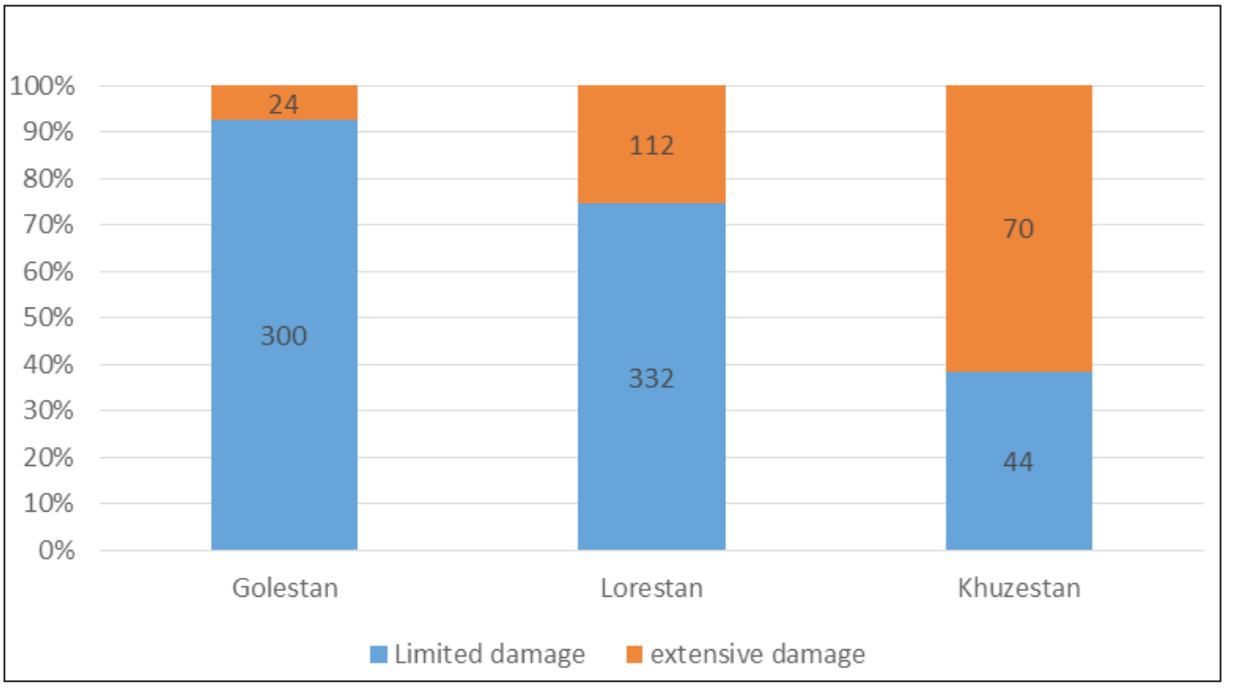


Figure 3. Number of affected schools in Golestan, Lorestan and Khuzestan

The damages to the education sector is summarized in terms of:

- Damage to educational facilities; and
- Damage to school supplies, equipment and materials.

Table 5: Estimated damage to government education facility structures

Type of School	Damage by Province		Total Damage	
	Lorestan	Golestan		
	Million IRR	Million IRR	Million IRR	USD
Primary School	1,146,332	656,450	**1,802,782**	**17,139,481**
Secondary School	413,098	284,375	**697,473**	**6,631,043**
TOTAL	**1,559,430**	**940,825**	**2,500,255**	**23,770,524**

In the above table, structures include the main school building, sanitation, walls, school gym, and conference room.

Table 6: Estimated Damage to Government Education Facility Supplies and Materials

Type of School	Damage by Province		Total Damage	
	Lorestan	Golestan		
	Million IRR	Million IRR	Million IRR	USD
Primary School	199,900	17,350	**217,250**	**2,065,000**
Secondary School	93,420	10,480	**103,890**	**987,800**
TOTAL	**293,320**	**27,830**	**321,150**	**3,053,250**

In the above table, materials include desks and chairs, boards, books and computers.

Loss

As described in the tables above, the main causes of loss in the education sector in the three flood affected provinces are:

- Cost of establishing temporary classrooms;
- Cost of clean-up;
- Unexpected costs like the destruction of roads that adds up to the cost of construction, and the cost of speeding up the construction process for the beginning of the school year.

Table 7: Estimated Loss to Government Education Facilities

Type of School	Loss by Province		Total Loss	
	Lorestan	Golestan		
	Million IRR	Million IRR	Million IRR	USD
Primary School	59,910	18,000	77,910	**770,000**
Secondary School	21,090	7500	28,590	**240,000**
TOTAL	**81,000**	**25,000**	**106,500**	**1,010,000**

Table 8: Summary of Damage and Loss in the Education Sector

Provinces	Total Damage and Loss: Education					
	Damage IRR (B)	Damage USD (M)	Loss IRR (B)	Loss USD (M)	Total Effect (Damage+Loss) IRR (B)	Total Effect (Damage+Loss) USD(M)
Golestan	940.83	8.94	25.50	0.24	966.33	9.19
Lorestan	1,563.01	14.86	81.00	0.77	1,644.01	15.63
Total	**2,503.84**	**23.80**	**106.50**	**1.01**	**2,610.33**	**24.82**

Note: The damage here is the sum of the structure and supplies and materials.

Social impact of damage and loss

While physical damage is easy to monetize, impact on the quality of education is more difficult to quantify and the cost associated with it depends on the recovery strategy employed by the government.

Unfotunately due the absence of the Ministry of Education from the PDNA process, the social impact analysis is based on anecdotal data and verbal communications of the officials.

The impacts of floods on the quality of service delivery in education sector include:

- Higher rate of drop-outs due to families' deteriorating economicconditions;
- Loss of educational time due to the closure of schools that put students in these provinces at a disadvantage compared to others, especially when they have to compete nationally for university entrance;
- Decrease in students' learning achievements which can result in higher rates of repetition of grades;
- The impact of trauma on students and families poses an increased risk of violence inside and outside of school;
- If the reconstruction and rehabilitation process is not completed until the beginning of the new year, higher class sizes in schools that are operating can negatively impact the quality of education.

Gender

Even though disagregated data based on gender was not available, past experience shows that such disasters, due to their negative impact on the economic situatuion of the family, can result in higher drop out rates for girls. This in turn can result in higher rates of low age marriage among girsls, and child labour among boys.

Based on un-official data from Golestan, its seems like the number of destroyed schools at theprimary level is similar for boys and girls but at the secondary level, 7 schools for boys and 1 school for girls have been completely destroyed.

3.4 Recovery Strategy & Needs

The School Renovation Organizationis the main entity responsible for reconstruction of schools. Based on its plans, all schools will be rehabilitated/constructed in the next 18 months. Thus, all needs willmet in short term.

Table 9. Short-term recovery needs

Recovery Needs				
Program of activity	**IRR (B)**	**USD (M)**	**Status**	**Responsible Agency**
Clean up of debris	31.77	0.30	Funded and completed	School Renovation Organization
School reconstruction	2,500.26	23.77	Ongoing	School Renovation Organization
Provision of equipment for schools	321.14	3.05	50% funded (IRR 580,000 Million remaining) -	School Renovation Organization
Purchase of temporary shelters as classrooms	62.70	0.60	60% funded (IRR 25,000 Million remaining)	School Renovation Organization
Total	2,915.87	27.72		

Table 10. Short term recovery needs by provinces

Province	Short term recovery needs	
	IRR (Billion)	USD (Million)
Golestan	1079.43	10.26
Lorestan	1836.44	17.46
Total	2915.87	27.72

Clean up efforts have been completed in both provinces. Therefore in the above table, some of the expenses have already been paid. In the area of school reconstruction, all 3-classroom and smaller schools will be finished and equipped by September 2019. The remaining schools will be ready for the next school year. It is important to note that the time limitations for the reconstruction of schools have increased the cost to up to 30%. Out of 210 temporary shelters that are necessary for temporary classrooms, 126 have already been purchased and 83 have to be purchased in the next 2 months. The unfunded needs as of this report is estimated to be IRR 605 billion (USD 5.75 Million) for 2019-2020 activities.

In discussion with officials from the Ministry of Education, it was proposed to set up a disaster management taskforce with representatives from several deputies of the Ministry (primary, secondary, health, School Renovation Organization). It was also mentioned that defining indicators and guidelines for fast and efficient collection of data before and after a disaster, and developing a disaster response guideline were the most urgent tasks of for this group.

3.5 Assessment Methodology

Assessment limitations

- The absence of the Ministry of Education from the main meetings of the PDNA process made it difficult to coordinate effectively between different sectors and collect the necessary data, especially on the social impact of the floods. The only entity present in the process was the School Renovation Organization which could only provide information on the facilities and equipment, and not on the students.
- Due to the absence of the Ministry of Science and Technology (responsible for higher education), the Technical and Vocational Training Organization (TVTO) (Responsible for technical and vocational training institutes) and the organization for Private Schools, the reported data is limited to public schools at the primary and secondary levels.
- The data were not disaggregated by gender. Even though the Ministry of Education has done some analysis on the issue, there were no such data available for this report.
- In this report, provincial-level data are used, which can mask some of the demographic characteristics of the affected areas.
- The lines of authority were vague in the process of needs assessment, and therefore the suggested coordination mechanisms by PBO for PDNA were inefficient and ineffective.

4. Culture and Tourism

4.1 Summary

The three provinces of Khuzestan, Lorestan and Golestan a large number of historical monuments and sites, historical fabric, museums and site registered on UNESCO world Heritage List as well as national heritage list. In total there are 4 UNESCO World Heritage Sites in the affected provinces. The high precipitation and flood caused physical damages to the monuments mostly in the form of cracks in the ceilings, moisture in the walls and increasing deterioration of roof tiles and facade. Initial assessments conducted by teams for the monuments managed by the ICHHTO indicate that damage to monuments were caused by rainfall, flooding and scouring as well as by river flood, sea tides and objects being carried away by the flood waters. In addition, changes to the sites such as increased growth of plants after the rainfall/floods have also caused damage to the monuments.

In these provinces, there are a number of both industrial and home-based workshops related to handicrafts. More than 50% of the persons working in the handicrafts sector are women, who are income generators for the family.

As for the tourism aspect, Nowruz and summer holidays are when most Iranians travel. Each year during Nowruz holidays more than 70 million nights are reported for accommodation. The three provinces of Golestan, Lorestan and Khuzestan are among the top attractions for travelers during Nowruz holidays. There are several natural and cultural heritage sites in the mentioned provinces which are visited by the travelers. The floods prevented potential visitors from travelling to these provinces.

Most damage and loss in Intangible Cultural Heritage (ICH) can be seen in traditional handicrafts. As it was difficult to assess other instances of the ICH, the report focuses on handicrafts. The best possible instances which represent ICH are traditional craftsmanship and as this section has the most concrete facts, this report focuses on it more than any other instances of ICH.

The impact of the floods on culture, both tangible and intangible elements of it, also resulted in psycho-social disruption, with negative effects on community cohesion and resilience. Impact on the world heritage sites, however, due to their significant role in the livelihood and memory of the local communities, would expose much loss in the social context of the area.

In addition to the critical post-crisis measures to be adopted to facilitate the recovery of the sector, review of the extent of damages to cultural heritage monuments also suggest the need for detailed assessment to determine the appropriate management structure for the historical monuments, national and global values and priorities, and adequacy of post-crises measures. Such as assessment should be carried out for all three categories currently used for Cultural heritage sites, including the monuments registered in world heritage list or national heritage list, and Museums.

The recovery needs due to damage suffered by the handicraft sector fall under three categories: (i) cost of reconstruction/repair of damaged or destroyed workshops, (ii) cost of replacement or repair of lost or damaged tools (including looms), and (iii) cost of finished produce damaged or swept away or destroyed.

To facilitate recovery of the handicrafts and cultural heritage, recovery strategies in the short-, medium- and long-term focus on the following:

Handicrafts: Supplying tools and instruments; Reconstruction or renovation of affected workshops; Replacement or compensation for lost products;

Cultural heritage: Restoration and conservation measures; Regeneration of economic and social conditions; and monitoring and developing a HBIM database.

The estimated damage and loss for culture and tourism is shown in the table below.

As for tourism, for short-term recovery of the tourism sector, tourist facilities that were insured prior to the floods could utilize insurance payouts for immediate repairs and restoration of their operations. Hence, assistance maybe provided to tourist facilities in claiming insurance pay outs and also making any adjustments to the price of services to accommodate the higher operational costs.

Medium term strategies can focus on tourism promotion and campaign to bring greater focus and attract tourists to the tourist sites in the affected provinces through advertisement and marketing; organizing festivals and tourism events in the affected areas.

Long-term recovery of the sector should focus on, among other things, development and implementation of a comprehensive Disaster Preparedness and Risk

Reduction program for enhancing resilience of tourism sector to combat potential natural disasters. Capacity building of government staff and key stakeholders of the tourism industry (including private service providers) on disaster response, recovery and risk reduction related to tourism should be an integral part of this program.

Due to the unavailability of data at the time of preparation of this report, estimates of the recovery needs for the tourism sub-sector are not included.

Table 1: Damage and Loss for the Culture and Tourism Sector

Province	Damage IRR (Billion)	Damage USD (Million)	Loss IRR (Billion)	Loss USD (Million)	Total Effects (Damage+Loss) IRR (Billion)	Total Effects (Damage+Loss) USD(Million)
Khuzestan	1,468.57	13.96	43.04	0.41	1,511.61	14.37
Lorestan	699.03	6.65	26.70	0.25	725.73	6.90
Golestan	728.89	6.93	47.39	0.45	776.28	7.38
Total	2,896.49	27.54	117.13	1.11	3,013.62	28.65

Table 2. Recovery Needs for the Culture and Tourism Sector

Province	Recovery Needs							
	Short term		Medium term		Long term		Total	
	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Khuzestan	1198.85	11.40	69.48	0.66	72.30	0.69	1340.64	12.75
Lorestan	575.57	5.47	33.36	0.32	34.71	0.33	643.64	6.12
Golestan	615.66	5.85	35.68	0.34	37.13	0.35	688.48	6.55
Total	**2390.09**	**22.72**	**138.52**	**1.32**	**144.15**	**1.37**	**2672.76**	**25.41**

4.2 Sector Background

4.2.1 Culture

The three provinces of Khuzestan, Lorestan and Golestan have large number of historical monuments and sites, historical fabric, museums and site registered on UNESCO world Heritage List as well as national heritage list.

In Lorestan Province, there are more than 2300 monuments registered in national heritage list and two monuments included in the tentative list of UNESCO World Heritage. The Province is also renowned for its 100 historical bridges. In Golestan Province, there are 149 monuments inscribed on the national list. The damages are caused by high precipitation and flood. The physical damages to the monuments are mostly inform of cracks in the ceilings, moisture in the walls and increasing deterioration of roof tiles and facade. In addition to the listed monuments, 15 non- inscribed valuable monuments within the vicinity of Gorgan are suffered from the flood.

Khuzestan Province, the richest province of the country in terms of cultural heritage, has 982 nationally registered monuments, three monuments included in world heritage list and many other monuments, customs and intangible knowledge. Among provincial cultural heritage bases, three monuments in Chogha Zanbil, Susa, and Shushtar Historical Hydraulic System were included in World Heritage List. Chogha Zanbil and Susa have historical artifacts, museums and archeological remains. In total there are 4 UNESCO World Heritage Sites in the affected provinces.

The high precipitation and flood caused physical damages to the monuments mostly in the form of cracks in the ceilings, moisture in the walls and increasing deterioration of roof tiles and facade.

Handicrafts:

In the provinces of Golestan, Lorestan and Khuzestan, there are a number of both industrial and home-based workshops related to handicrafts. More than 50% of the persons working in the handicrafts sector are women, who are income generators for the family. The following table shows the number of workshops under each category by province and the activities they support.

Table 3: Number of workshops per province

Name of Province	Number of Home Workshops	Number of Industrial Workshops	Main Activities
Khuzestan	3892	3716	Mat weaving, praying pad weaving (i.e. Ahrami weaving), making wooden products, enamel-covering, making traditional clothes and footwear
Lorestan	2366	6762	Weaving on loom (rug and traditional overcoat), metal forging making wooden arts
Golestan	1925	19866	Loom-based weaving (rug, plas, felt and carpet), leather products (e.g. traditional saddle), traditional jewellery making, making local clothes, traditional covers, and traditional textiles along with silk weaving, batic printing, felting making artistic wooden products

Intangible Cultural Heritage:

Article 2 of the Convention of Safeguarding of Intangible Cultural Heritage defines the term 'Intangible Cultural Heritage' (ICH) as "the practices, representations, expressions, knowledge, skills– as well as the instruments, objects, artefacts and cultural spaces associated therewith– that communities, groups and, in some cases, individuals recognize as part of their cultural heritage. This intangible cultural heritage, transmitted from generation to generation, is constantly recreated by communities and groups in response to their environment, their interaction with nature and their history, and provides them with a sense of identity and continuity, thus promoting respect for cultural diversity and human creativity. For the purposes of this Convention, consideration will be given solely to such intangible cultural heritage as is compatible with existing international human rights instruments, as well as with the requirements of mutual respect among communities, groups and individuals, and of sustainable development.

The intangible cultural heritage, as defined in paragraph 1 above, is manifested inter alia in the following domains:

(a) oral traditions and expressions, including language as a vehicle of the intangible cultural heritage;

(b) performing arts;

(c) social practices, rituals and festive events;

(d) knowledge and practices concerning nature and the universe;

(e) traditional craftsmanship".[1]

Examples of traditional craftsmanship in affected provinces are as in weaving on loom (rug, felt and carpet), leather products (such as traditional saddle), traditional jewelry, local and traditional clothes, traditional decorative cover, traditional textile, silk weaving, batik printing, felting, wood arts, rug and *mashte* weaving, manual metal forging, handcrafted wooden products, mat weaving, praying pad weaving (*Ehrami*), wooden products, enamel, footwear, etc.

Women play a significant role in maintaining the intangible cultural heritage as bearers or practitioners of local cuisine and local dances, constituting 50% of the labor force in the craft sector as well as collaborating with men in harvesting.

Most damage and loss in ICH can be seen in traditional handicrafts. As it was difficult to assess other instances of the ICH, the report focuses on handicrafts. The best possible instances which represent ICH are traditional craftsmanship and as this section has the most concrete facts, this report focuses on it more than any other instances of ICH.

1. https://ich.unesco.org/en/convention

4.2.2 Tourism

Nowruz and summer holidays are when most Iranians travel. Each year during Nowruz holidays more than 70 million nights are reported for accommodation. The three provinces of Golestan, Lorestan and Khuzestan are among the top attractions for travelers during Nowruz holidays. There are several natural and cultural heritage sites in the mentioned provinces which are visited by the travelers. The floods prevented potential visitors from travelling to these provinces.

4.3 Assessment of Disaster Effects

4.3.1 Culture

4.3.1.1 Damage

Historic Monuments and Heritage Sites:

Golestan

In Golestan province 9 sites were affected in which 4 of them are public and 5 private. High precipitation and flooding caused damages to all 149 listed monuments, resulting in cracks in the ceilings, moisture in the walls and increasing deterioration of roof tiles and facade. In addition to the listed monuments, 15 non-inscribed valuable monuments within the vicinity of Gorgan also suffered damages from the flood.

Lorestan

In Lorestan province, 71 sites and monuments were affected all of which are public. Except for the remains in the path of river floods, most of the historical monuments of the province have not been damaged much since they were built on higher ground. Considering the volume (i.e. 3.100 billion cubic meters) and flow rate of Kashkan river (more than 5000 cubic meters), some of the historical bridges were damaged.

The major site affected in Lorestan Province is Falak Al-Aflak. Although the landslides did not damage the castle, it was damaged by water scouring.

Khuzestan

In Khuzestan, floods caused water level in the river to rise significantly, impacting the Shushtar Historical Hydraulic System. In the cultural heritage site of Susa, heavy rainfall submerged a part of Shahr Shai critically and growth of vegetation has reached risky levels. Due to the damage suffered by flood dams, more than 29 million cubic liters of water has accumulated in some places.

Also, the historical sites of Ramhormoz, castles and the historical premises of Baghomlak as well as historical remains and single buildings in cultural heritage sites of Shushtar and Dezful were significantly damaged.

In total in Khuzestan Province, 72 cultural heritage structures were affected of which 59 are public and 13 private. In total, four UNESCO World Heritage Sites were affected. The total damage to the cultural heritage of Khuzestan Province is estimated at IRR 1,392,000 million.

Handicrafts:

The economic impact on the handicrafts sector is startling. The survey data corroborated by the estimates of the Department of Handicrafts shows that the recovery needs due to damage suffered by the handicraft sector fall under three categories: (i) cost of reconstruction/ repair of damaged or destroyed workshops, (ii) cost of replacement or repair of lost or damaged tools (including looms), and (iii) cost of finished produce damaged or swept away or destroyed.

Since majority of households that are engaged in handicrafts and hand weaves are in rural regions, agricultural activities are fundamental to their organisation and income. The March-April 2019 floods submerged great tracts of cropland and washed away much of the transport and communications infrastructure on which the agricultural, horticultural and animal husbandry produce depends.[1] This double blow hit Iran's intangible cultural heritage associated with handicrafts and knowledge bearing households hard.

For households with crafts-related and agricultural loss and damage, the only recourse is to seek employment (even if short term or part-time) wherever it can be found for the survival of the family and to enable reconstruction and repair. Even where immediate relief has been forthcoming, and where short-term zero rate finance has been advanced, it is sufficient to ensure survival but not more.

The survey findings indicate the circle of misery into which such households tumble following a natural

1. https://cropmonitor.org/index.php/2019/04/17/special-update-flood-impacts-in-iran-and-iraq/

disaster of this scale in the absence of strong and timely rehabilitation programmes. Many are likely to resort to distress employment, leading to loss or cessation of crafts-based income, no time spent in transmission of knowledge, and with communities deprived of the services or arts or produce of someone who was until March 2019 a skilled, sought-after and productive craftsperson.

Golestan

The major handicraft-related professions which were affected by flood in Golestan Province are loom and non-loom based weaving (i.e. rug, plas, felt and carpet), making leather products, dutar-making, making traditional clothes, traditional jewelry making, rug weaving, statue making, traditional cover weaving, silk weaving, plas weaving, felting, and traditional textile.

The 381 workshops that have been either destroyed or damaged are located in villages of Kord, Salaq Yalqi, Hakim Abad, Qorban Abad, Qanqorme, Taze Abad, Gamishli Nazar, Qare Qamishli, Niaz Abad, Ali Abad (also known as Fazel Abad), Zav Sofla, Yasqolq, Orjanli, Qodane Olia, Qodane Sofla, Qare Yasr Olia, Gachisoo Olia, Tamarqare Qozi, Bash Oili, Arab Buran, Yasang Olia, Sarcheshme, Chaqrabesh Qaradash, Qaraq, Ab Paran, Bash Olia, Farsian, Aq Qamish, Farang, Qala Tape, Adeldel, Bash Oila, Pano, Hussein Abad Qorbani, Yasang Sofla, and towns of Kalaleh, Turkmen Port and Galikesh.

In Golestan Province, ***seventy*** percent of the raw materials (wool) stored in the workshops became unusable. The rough assessment by the surveyors indicate that the extent of damage to residential premises, work spaces, equipment and tools, materials, finished and semi-finished produce are 25%, 50%, 75% and 100% respectively.

Lorestan

In Lorestan Province, 150 workshops have been either destroyed or damaged. The workshops are located in Khoram Abad, Noor Abad, Koohdasht, Aligodarz, Pol-e-Dokhtar, Dorood, Afarineh, Mamulan, Boroojerd, and Alshtar. The major handicraft-related professions in Lorestan Province which were affected by flood are rug and traditional overcoat weaving, making wooden products and metal forging.

Khuzestan

In Khuzestan Province, 765 workshops have been either demolished or damaged. The workshops are located in Izeh, Behbahan, Masjid Suleiman, Rafii, Abadan, Hamidieh, Lali, Andika, and Ahvaz. The major handicraft-related professions in Khuzestan Province which were affected by flood are rug weaving, traditional pottery, felting, cloak weaving, traditional overcoat weaving (i.e. Choqa weaving), patterned cloth (i.e. Buria) weaving, enameled pottery making, wooden grid making, making traditional clothes, rug weaving, making handicraft products, making traditional jewelry.

Table 4: Estimated damage incurred by the most affected traditional workshops in Khuzestan, Golestan and Lorestan

Type of Workshop	Damage IRR (Billion)
Weaving on loom (for rug, felt, carpet)	0.26
Silk Weaving	0.1 – 0.194
Mashte Weaving	0.6
Traditional Cover	0.105-0.282; up to 0.327

Table 5: Estimated Damage Incurred by Traditional Workshops in the Turkmen Areas (Golestan)

Type of Damage	Damage IRR (Billion)
Raw Materials & Finished or Unfinished Handicraft Products rendered unusable	0.275
Consolidated Damage to Workshop Premises	0.04

Up to the date of writing this report, most of the paths leading to the damaged or destroyed workshops were blocked and workshops filled with flood debris. Since accurate data on income generated by the workshops was not available, income loss due to the floods could not be estimated.

As the survey findings illustrate, the percentage of affected ICH practitioners in the three provinces, and the number of those whose workshops have been damaged and whose equipment and raw material has been lost or destroyed, varies by type of ICH element. In the Turkmen regions the survey indicated that in the clusters of the Gonbad, Turkmen Port, Aq Qala, Kalaleh and Marave Tape administrative sectors of Golestan, nearly 500 of the 6,500 craftspeople engaged in handicrafts suffered extensive damage. In the same province and sectors, 75% of the nearly 200 people engaged as groups organising traditional and musical events also suffered extensive losses.

4.3.1.2 Loss

Due to the intensity of rainfall during the Nowruz holidays of 2019, tourists were forbidden from visiting the historical site of Chogha Zanbil to protect the structure from further damage and erosion due to visitor traffic. As a result, income from ticket sales was significantly reduced. The loss caused during closure of the premises was estimated based on recorded number of visitors in similar days of previous year and projected increase in number of visitors in the current year. The results are as summarized in the table with below.

4.3.1.3 Summary of Damage and Loss in Culture

Table 6: Damage and loss in culture by sub-sector

Sub-sector	Damage				Loss			
	Public	Private	Total Damage		Public	Private	Total Loss	
			IRR (Billion)	USD (Million)			IRR (Billion)	USD (Million)
Historical buildings/structures and urban fabric	NA**	NA	2,256.350	21.45	NA	NA	48.5904	0.46
Museums	80.70	0	80.70	0.77	0.20	0	0.2000	0.0019
Cultural facilities	0.96	0	0.96	0.01	NA	NA	NA	NA
Handicraft Industries and Relevant Industries	0	322.70	322.70	3.07	NA	NA	NA	NA
Intangible Cultural Heritage*	0	0	0.00	0	-	1.3810	1.3810	0.013129
Total	81.66	322.70	2,660.71	25.2960	0.20	1.3810	50.1714	0.47699

*Damage to ICH is captured under handicrafts
** NA refers to Not Available Data

Table 7: Damage and Loss in Culture by Province

Province	Damage		Loss	
	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Khuzestan	1403.57	13.34	0.51	0.005
Lorestan	658.30	6.26	2.20	0.02
Golestan	598.84	5.69	46.00	0.44
Total	**2660.71**	**25.30**	**48.71**	**0.46**

***** The sum does not correspond to the above table as the Loss to ICH per province was not disaggregated and therefore is not included in this figure.

4.3.2 Tourism

4.3.2.1 Damage

Typically, each year, during the Nowruz holidays, the domestic tourism-related travels increase significantly. The three provinces of Golestan, Lorestan and Khuzestan which are among the highest visitor receiving provinces, were affected by the flood. Extensive damage to the tourism infrastructure hampered the ability of service providers to deliver services to the tourists. Consequently, the tourism agencies experienced reduction in bookings. These also led to reduced revenues of the residential centers, tourist centers and travel agencies whereas the operational costs of the centers increased. Damage to inns, hotels as well as entertainment facilities and eco-tourism homestays had a direct impact on the tourism sector.

4.3.2.2 Loss

The loss incurred by the tourism sector was mainly due to the cancelation tours and travels to affected areas either because of the damage suffered by the accommodation facilities mentioned earlier or inability of the flood-affected households to travel to the neighboring provinces.

Discontinuation of investments and construction for a long period of time in affected areas that were labelled as “flood-affected areas” also contributed to the loss.

4.3.2.3 Summary of Damage and Loss in Tourism

Table 8: Damage and loss in tourism by sub-sector

Sub-sector	Damage				Loss			
	Public	Private	Total Damage		Public	Private	Total Loss	
			IRR (Billion)	USD (Million)			IRR (Billion)	USD (Million)
Hotels	0	1.00	1.00	0.01	0	41.42	41.42	0.39
Ecolodges	0	56.13	56.13	0.53	0	2.50	2.50	0.02
Tourism Facilities	10.00	59.20	69.20	0.66	0	24.00	24.00	0.23
Travel Agencies	69.45	0	69.45	0.66	0	0.50	0.5	0.01
Access Route to natural sites	40.00	0	40.00	0.38	0	0	0	0
Total	**119.45**	**116.33**	**235.78**	**2.24**	**0**	**68.42**	**68.42**	**0.65**

Table 9: Damage and loss in tourism by province

Province	Damage				Loss			
	Public	Private	Total Damage		Public	Private	Total Loss	
			IRR (Billion)	USD (Million)			IRR (Billion)	USD (Million)
Khuzestan	55.00	10.00	65.00	0.62	NA*	42.53	42.53	0.40
Lorestan	0	40.73	40.73	0.39	0	24.50	24.50	0.23
Golestan	0	130.05	130.05	1.24	0	1.39	1.39	0.01
Total	**55.00**	**180.78**	**235.78**	**2.24**	**0**	**68.42**	**68.42**	**0.65**

*NA refers to Not Available Data

4.3.3 Summary of Damage and Loss in the Culture and Tourism sector

The combined damage and loss in the culture and tourism sector are as follows:

Table 10: Damage and loss in culture and tourism sector by province

Province	Damage				Loss			
	Public	Private	Total Damage		Public	Private	Total Loss	
			IRR (Billion)	USD (Million)			IRR (Billion)	USD (Million)
Khuzestan								
Culture	NA*	NA	1,403.57	13.34	NA	NA	0.51	0.005
Tourism	55.00	10.00	65.00	0.62	0	42.533	42.53	0.40
Lorestan								
Culture	NA	NA	658.30	6.26	NA	NA	2.20	0.02
Tourism	-	40.73	40.73	0.39	0	24.50	24.50	0.23
Golestan								
Culture	NA	NA	598.84	5.69	NA	NA	46.00	0.44
Tourism	-	130.05	130.05	1.24	0	1.39050	1.39	0.01
Overall Loss of ICH	NA	NA	NA	NA	0	1.381	1.38	0.01
Total	**55.00**	**180.78**	**2,896.49**	**27.54**	**NA**	**69.80**	**118.51**	**1.13**

*NA refers to Not Available Data

The total Damage and Loss in Culture by Sub-sector does not correspond to Damage and Loss in Culture by Province, as the Loss to ICH per province was not disaggregated and therefore is not included in this figure.

4.3.4 Social impact of damage and loss

The impact of the floods on culture, both tangible and intangible elements of it, also resulted in psycho-social disruption, with negative effects on community cohesion and resilience. In these flood-affected areas, intangible cultural heritage and traditional systems of knowledge are central to community cohesion. Handicrafts and hand weaves, together with arts and festivals and social events that bring people together, are loci of communal activity, knowledge transmission and solidarity.

Families in which a craftsperson suffered injuries from the flood waters, such as a broken limb, are anguished with the uncertainty of whether the limb will regain

ability and control (crucial to musicians, needle workers and the like). Harder still for the affected households is the mental tension and despair, the shock of seeing homes, workshops, cattle and belongings destroyed or swept away before their very eyes.

Beyond the economic impact of the extensive damage suffered, homes with their courtyards submerged under waist deep water, raw material for handicrafts battered by the flood waters and fused into a pulpy mass, and rubble where a workshop once stood, have had a significant negative impact on the sense of well-being of the households and the communities.

Large number of residential structures, both home workshops and handicrafts workshops, and stores or raw material and finished (or partly finished) goods were damaged or destroyed. In several cases, the workshops served as both production centres and training centres simultaneously. Damage to these workshops which rendered them unusable has interrupted the transfer of knowledge to members of the community or tribe.

For example, one of the active felting workshops in Aq Qala was not able to resume even four months after the floods due to significant damage to the workshop and the great risk of its collapse. Meanwhile, 70% of the raw materials (wool) stored in the workshop became unusable - the soaking had caused the fibres to adhere together and then insects had spoiled the remainder. Besides, the stink of rotting wool made it impossible for even those crafts persons who could work to do so.

There is a real threat of cultural knowledge and skills associated with these handicrafts being replaced by other, non-cultural, skills or discontinued if measures are not taken on an urgent basis to provide premises and spaces for training for their uninterrupted of transmission.

Other impacts include disruption of cultural practices. The interviews revealed that after the emergency relief period and during the early recovery phase, in the Turkmen tribes, many communities were not holding ceremonies and events that they are normally central to. These include: Lale-Khani (Turkmen women's songs in Gharibe Tribe), Turkmen sword dance, Turkmen religious singing and traditional music.

The surveys also emphasized the importance of handicrafts and local arts to a society's need for stabilising its sources of identity. For example, that the range of crafts activities carried out by the Turkmen populations - felting, mat weaving, carpet weaving, gazebo making, needlework, jewellery making, musical instrument making, needlework - was heavily impaired because of the damage to and destruction of the raw materials they had in stock (such as wool, cloth, string and wood) often of up to 70% by weight or volume.

In the provinces of Golestan, Lorestan and Khuzestan, there are a number of both industrial and home-based workshops related to handicrafts. More than 50% of the persons working in the handicrafts sector are women, who are income generators for the family. The following table shows the number of workshops under each category by province and the activities they support.

Women play a significant role in maintaining the intangible cultural heritage as bearers or practitioners of local cuisine and local dances, constituting 50% of the labour force in the craft sector as well as collaborating with men in harvesting.

Most damage and loss in ICH can be seen in traditional handicrafts. As it was difficult to assess other instances of the ICH, the report focuses on handicrafts.

The best possible instances which represent ICH are traditional craftsmanship and as this section has the most concrete facts, this report focuses on it more than any other instances of ICH.

Coping strategies

Our surveyors were told in several locations that after the flood, local assistance and support for residents of a neighbourhood or for relatives was offered spontaneously by donors who were concerned that the crafts workshops and household industries should continue to function. Raw materials and tools proved to be the most practical and immediate local relief. In one case, a craftsman whose home and workshop was heavily damaged by the waters was given a few bags of wool so that he could continue his craft, although at a much smaller scale than previously.

The quick granting of zero rate loans by mosque funds or local communities funds to those affected by the flood also proved to be timely financial interventions, wherever they were made. After the emergency relief period, damaged workshops were prioritised for the replacement, at no cost to craftspeople, of tools and equipment from the Cultural Heritage Organization,

Deputyship of Handicrafts, and the Department of Development and Promotion. As stabilisation measures, cooperatives in villages were also encouraged to assist the sale of new crafts produce, and the participation - in provincial, national and international crafts expositions - of craftspeople who had experienced damage of workshops and loss of produce was given special attention.

It is just as important to include the damage suffered by a mosque, cultural centre or library (estimated at about IRR 300 million in each case) as they serve as designated cultural spaces either for the transmission of craft and art, or for its public practicing and demonstration, or as an event space that brings together the community in appreciation and participation (such as the Turkmen sword dance and music).

The loss suffered by households in a majority of the regions covered by the surveys exceeds the average annual rural household income. The annual income is a gross figure, from which routine expenditures are possible and thereafter savings or investment in crafts assets and materials - either as outright purchase or, as is more likely, as contribution based on which credit and co-funding become available.

The 13 ICH elements of the Islamic Republic of Iran in the lists of the UNESCO 2003 ICH Convention are but the most internationally visible of the wide range of ICH in the country, some of which have been listed in the survey and many more of which have been covered in the post-disaster assessments by the Department of Handicrafts, the Cultural Heritage Organization, Department of Handicraft Industry, and the Department of Development and Promotion.

The March-April deluge and resulting floods have perhaps helped uncover the relatively fragile conditions under which handicrafts, hand weaves and arts practitioners carry out their activities, which are fundamentally cultural but serve important social needs, contribute to environmentally sustainable livelihoods, and contribute substantially to local economies.

4.4 Recovery Strategy & Needs

4.4.1 Culture

Handicrafts and Intangible Cultural Heritage

Based on surveys, a very large number of residential structures, both home workshops and handicrafts workshops, and stores or raw material and finished (or partly finished) goods were damaged or destroyed. In several cases, the workshops served as both production centres and training centres simultaneously. It is the damage to these workshops have rendered them unusable thereby interrupting the transfer of knowledge to members of the community or tribe.

Short-term Recovery Needs

For the recovery of intangible cultural heritage, one of the key needs therefore is the **provision of premises and spaces for training** so that the interruption of transmission of knowledge and skills is not prolonged to the point where it is replaced by other, non-cultural, skills or discontinued.

Considering the extensive damage to workshops, tools and instruments in the provinces of Golestan, Lorestan and Khuzestan, the short-term priority is to bring back, as soon as possible, the craftsmen and craftswomen to the economic cycle, by restoring their productive capacity and providing employment. The short-term recovery strategy therefore is to supply tools and instruments to replace the damaged ones for 765 workshops. The required fund for the mentioned is **IRR 90,089 million**.

Medium- and Long-term Recovery Needs

The state ministries and agencies, the private sector, cooperatives and associations in the crafts and weaves sector, organisations dedicated to the arts and environment, must coordinate to address the medium to long term needs. Primary among them is the **transmission of ICH and the continued transfer of systems of knowledge from one generation to the next**, and not prolong the inevitable interruptions it has seen. This will require a renewed effort in the areas of **vocational guidance and skill building** (overlapping with technical and vocational education and training (TVET) programmes which can be flexible enough to support handicrafts and hand weaves) and the support it needs

from non-formal education and existing (prior to the floods) community institutions.

The survey findings suggest the following means to revive the ICH with community engagement:

- Offering of no cost and appropriate spaces for holding events and customary ceremonies
- Redesign of storage spaces for raw materials
- Provision of loans by the government from development funds
- Redeployment of budgets of rural and tribal employment to flood-affected entrepreneurs
- Payment of unemployment insurance to workers and farmers affected by the floods.

Other strategies include re-examination of the finance, material and market aspects of handicrafts, hand weaves, performing and festival arts, and associated agricultural sector activities. Craftspeople and ICH knowledge bearers are typically, in rural areas and peri-urban settlements alike, part of households with multiple streams of income. Diverse sources of income are a time-tested risk reduction method.

For the great majority of households, handicrafts activities co-exist with agricultural activities. The floods of March and April 2019 affected both these pillars of the household income. Hence any and all finance, material and market related interventions towards long term rehabilitation must work from the point of view of the household, not the sector.

Cultural Heritage: Sites and Monuments

Short-term Recovery Needs

Due to the extent of damage and loss to the cultural heritage sites and facilities, including World Heritage, Cultural Heritage or Museum and Material Cultures (the cultural objects displayed at museums), the short term focus should be on restoration and maintenance of the damaged sites, with due attention to structural safety. The urgent implementation of restoration and conservation measures is considered a short-term priority due to the importance of preventing further degradation and preserving the value of these cultural assets as well as to ensure that they do not pose any risk to visitors.

The implementation of these strategies, financed through allocation of existing resources, should **involve the local communities in restoration and preservation measures** to rapidly attain the outcome. For this, a draft plan must be developed for each site.

Medium-term Recovery Needs

In the medium term, the cultural heritage sector will focus on the regeneration of economic and social conditions at the heritage sites with the involvement of the local communities.

Long-term Recovery Needs

In the long term, the focus should be on periodic monitoring of cultural heritage as well as developing a Heritage Building Information Modeling (HBIM), which is a model for monitoring database.

Table 11: Summary of short-, medium- and long-term recovery strategy and needs for culture by sub-sector

Sub- sector	Short term	Estimated cost (Billion IRR)	Medium term	Estimated cost (Million IRR)	Long term	Estimated cost (Billion IRR)
Handicrafts	Supplying tools and instruments	90.19	Reconstruction or renovation of affected workshops	132.5	Lost products	99.14
Cultural Heritage	Restoration and conservation measures	2300	Regeneration of economic and social conditions	6	monitoring and developing HBIM database	45

The 2019 floods underline the need for a more systematic approach to assessment of damage, loss and recovery needs of the culture sector within the PDNA process in Iran. It also highlights the need to adapt the Iranian disaster management structure for monitoring of recovery and disaster risk reduction activities at the national, provincial and local levels, with due consideration to culture built into such a structure. Methods used by the creative industries (especially concerning handicrafts and hand weaves) and those that

have been used since 2011 for the implementation of the UNESCO 2003 ICH Convention could be employed, with a particular emphasis on integral safeguarding and community-based documentation.

4.4.2 Tourism

Despite the significance of the tourism sector for the recovery of the affected provinces, due to lack of availability of accurate information on recovery needs at the time of preparation of the PDNA Report, a comprehensive assessment of the recovery needs for the tourism sector could not be conducted. However, based on the estimated damage and loss and perceived needs (not the estimated needs) of the sector, certain recovery strategies are suggested.

It is suggested that the Ministry of Handicrafts, Cultural Heritage and Tourism through the ICHHTO use the latest available information on the recovery needs related to tourism in the affected Provinces to further develop a set of initiatives, and their estimated funding needs are based on discussions with the relevant governmental and private sector stakeholders at the national, provincial and local levels.

Recommended recovery strategies and needs for the Tourism sub-sector are as follows:

Short-term Recovery Needs

For short-term recovery of the tourism sector, tourist facilities that were insured prior to the floods could utilize insurance payouts for immediate repairs and restoration of their operations. Hence, assistance maybe provided to tourist facilities in claiming insurance pay outs and also making any adjustments to the price of services to accommodate the higher operational costs.

In the case of tourist sites that have not been affected by the floods or will be restored immediately, recovery of access roads and other vital transportation facilities, restoration of water and sanitation facilities, energy supply, etc. should be prioritized in the respective sectors to facilitate economic recovery of the affected provinces.

Medium-term Recovery Needs

Some of the suggested activities in the medium term to support recovery of the tourism sector include:

- Tourism promotion and campaign to bring greater focus, and attract tourists to the tourist sites in the affected provinces through advertisement and marketing;
- Organizing festivals and tourism events in the affected areas.

Long-term Recovery Needs

Long-term recovery of the sector should focus, among other things, on development and implementation of a comprehensive Disaster Preparedness and Risk Reduction program for enhancing resilience of tourism sector to combat potential natural disasters. Capacity building of government staff and key stakeholders of the tourism industry (including private service providers) on disaster response, recovery and risk reduction related to tourism should be an integral part of this program. Other recommended recovery strategies include, (i) establishing the necessary enabling legal environment for the resilient recovery and risk-informed development of the tourism sector, through drafting and adoption of regulations, policies, guidelines and standard operation plans; and (ii) inclusion of support institutes such as entrepreneurship funds to recover the affected tourism facilities and infrastructures.

4.4.3 Recovery Needs

Table 12: Summary of recovery strategies and needs of the culture and tourism sector

Sub-sector	Program of Activity	Recovery Needs							
		Short-term		Medium-term		Long-term		Total	
		IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Handicrafts	Supply of tools and instruments	90	0.86					90	0.86
	Reconstruction or renovation of affected workshops			133	1.26			133	1.26
	Replacement of / Compensation for lost products					99	0.94	99	0.94
Cultural Heritage	Restoration and conservation measures	2,300	21.87					2,300	21.87
	Regeneration of economic and social conditions			6	0.06			6	0.06
	Monitoring and developing HBIM database					45	0.43	45	0.43
Tourism*	Assistance in claiming insurance pay outs	NA	NA						NA
	Tourism promotion			NA	NA				NA
	Disaster Preparedness and Risk Reduction programme for tourist sites, essential facilities and service providers					NA	NA		NA
TOTAL		**2,390**	**22.72**	**138.52**	**1.32**	**144.14**	**1.37**	**2672.76**	**25.41**

*Resources required for suggested activities have not been estimated due to lack of availability of accurate information on recovery needs at the time of preparation of the PDNA Report.

It is worth mentioning the reason that amount for Recovery of Culture and Tourism is only proposed for recovery of damage, not loss. In addition, no amount was available for recovery of tourism sector.

Table 13: Summary of recovery needs of the culture and tourism sector by province*

Province	Recovery Needs							
	short term		medium term		long term		Total	
	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Khuzestan	1198.85	11.40	69.48	0.66	72.30	0.69	**1340.64**	**12.75**
Lorestan	575.57	5.47	33.36	0.32	34.71	0.33	**643.64**	**6.12**
Golestan	615.66	5.85	35.68	0.34	37.13	0.35	**688.48**	6.55
Total	**2390.09**	**22.72**	**138.52**	**1.32**	**144.15**	**1.37**	**2672.76**	**25.41**

* Since Province-wise breakdown of recovery needs was not available, the recovery needs are distributed across the two provinces based on their percentage share of the total damage and loss.

4.5 Assessment Methodology

The data was collected from cultural heritage, handicrafts and tourism deputies of the ICHHTO. The data on damage of tangible cultural heritage including monuments, cultural heritage site, historical fabric, museums and cultural facilities as well as handicrafts and tourism was based on the information ICHHTO collected from its provincial offices.

The loss of tangible cultural heritage items which mentioned above calculated based on lost number of visitors. The loss of Intangible Cultural Heritage was calculated based on the questionnaire developed by the ICH expert introduced by ICHHTO and international ICH expert. The provincial ICHHTO staff supported filling out the questionnaire from local communities and was analyzed by the international ICH expert.

Limitation: Interviews with local communities would have led to more accurate data on loss on ICH, which did not happen within this exercise. Therefore, the main focus was on handicrafts and not all the ICH elements. Some other factors such as access to the site, hotel, ecolodges and other facilities could also have been captured by field visits.

Section 2

PRODUCTIVE SECTORS

5. Agriculture, Fisheries and Livestock

5.1 Summary

Further to the 2019 spring floods, a Post Disaster Needs Assessment (PDNA) was conducted for the Agriculture Sector in two highly affected provinces of Golestan and Lorestan. The PDNA was conducted in cooperation with the Ministry of Agriculture Jahad, Iran Space Agency, the Plan and Budget Organization and FAO. The team estimated the damages, losses and recovery needs during the PDNA process. Based on the conducted assessments the total amount of damage and loss in both provinces is IRR 39,885.93 Billion (equivalent to USD 1,502.532). The Ministry of Agriculture Jahad has estimated the total short-term recovery needs at is IRR 1,471.70 Billion (equivalent to USD 13.992 Million) and the total medium-term and long-term needs at IRR 6,243.10 (equivalent to USD 59.355 Million).

The two affected provinces have a high production of agriculture goods. The provinces are self-sufficient and surplus production is exported to provinces in the country. Agriculture production from the two provinces also contributes to the total GDP of the country, the main goal of the Ministry of Agriculture Jahad is to become self-sufficient in production of agriculture. Given the critical importance of the sector in revival of the economy, it is important to invest in making the sector disaster and climate resilient. The chapter proposes measures to improve practices in crop production, oilseeds, livestock management, fisheries and aquaculture protection and a climate resilient approach to horticulture. The recovery strategy of the chapter also recommends a climate-smart agro-forestry and reforestation strategy, to address the limited forest cover and issues with slope land erosion. Finally, it recommends that as a part of the climate resilient agriculture focus, the protection of the wetlands and conservation of bio diversity in Urmia Lake and Hoor-Al Azim should be given priority while building local community resilience against climate change. In the long term, it is proposed that all national and provincial level agriculture development plans are reviewed in for disaster risk reduction measures such as early warning systems, damage and loss data systems for the sector be integrated into the plans.

5.2 Sector Background

Overall performance of the agriculture sector

The Islamic Republic of Iran is an upper-middle income country with an annual Gross Domestic Product (GDP) of USD 454.01 billion (2017), which has been fluctuating over the last years due to political and economic impacts of sanctions. However, since 2015 with a GDP of USD 385.9 billion, it has stabilized, and currently enjoys a growth rate of 3.7 percent per annum. Its per capita GDP stands at USD 20,884 per annum and its poverty headcount of people living with less than USD 1.90 a day, stands at only 0.3 percent, down from 5.6 percent in 1990 (WB, 2017).

The agriculture sector represents nine percent of the GDP and absorbs just under 20 percent of the labour force of the total population of about 82 million people (WB, 2017). The average annual growth rate (2011-2015) within the agriculture sector was highest for agriculture services and processing (26.2 percent), followed by fisheries and aquaculture (11 percent), crop (4.8 percent) and livestock (3.1 percent). The forestry subsector has experienced a negative growth rate over the same period with - 0.9 percent (CoCIMA, 2017).

Agriculture Production

Globally, the Islamic Republic of Iran is a significant producer of agricultural products, and remains among the top twenty producers for a number of agriculture commodities, including wheat, sugarcane, fresh milk, tomatoes, sugar beets and potatoes. In addition, the Islamic Republic of Iran is the top producer of key agriculture cash crops like pistachios, barberry, caviar, saffron, stone fruits and other berries (FAO, 2016). The Islamic Republic of Iran's top 12 export products by export value are shown in Table 1 below.

Table 1: I.R. Iran's top 12 agriculture export products by value (FAOSTAT, 2016)

Commodity	Export value in thousand USD
Pistachios	687
Dates	98
Raisins	93
Crude materials	74
Cucumbers and Gherkins	58
Kiwi fruit	50
Cream, fresh	50
Vegetables, fresh	37
Watermelons	33
Apples	31
Almonds, shelled	25
Spices	**24**

Pistachios alone make up 18.9 percent of the countries food exports, followed by dairy products (5.0 percent), tomato paste (3.4 percent), saffron (3.1 percent) and sheep (3.0 percent). Alone, these five key commodities amounted to USD 2.066 billion in food and agriculture exports in 2016, at an annual growth of 0.3 percent between 2012-2016 (CoCIMA, 2016).

MAJ's goal for the I.R. Iran is to become self-sufficient in the production of a number of products, including wheat, barley, maize, oil seeds, sugar beet, sugar cane, poultry meat, red meat, milk and eggs to mitigate the effects of sanctions. It is expected that only wheat and milk production will significantly increase their production by 2026 (CoCIMA, 2016). Table 2 shows the overview of the Agriculture Sector in Pol-e Dokhtar and Mamulan Towns (Lorestan Province) and Gomishan and Aq Qala Towns (Golestan Province) Before 2019 Spring Floods.

Table 2: production of field crops and horticulture

Province	Town	Field Crops		Horticulture		Total	
		surface	production	surface	Production	Surface	production
Lorestan	Pol-e dokhtar	12,170	33,707	2,409	20,575	27,044	74,903
	Ma'mulan	14,874	411,96	1,971	16,835	4,380	37,410
Golestan	Gomishan	56,000	111,146	73	227	56072	111,373
	Aq Qala	75,359	266,408	325	1,703	75,684	268,111

Table 3: Livestock, poultry, fisheries and apiculture production (in tons)

Province	Town	Red Meat	Chicken	Fish	Raw Milk	Honey Bea	Total
Lorestan	Pol-e dokhtar	1,349	765	400	667	450	3,631
	Ma'mulan	1,648	935	510	815	330	4,238
Golestan	Gomishan	1,119	13,250	20,000 (shrimp)	46,118	10	60,497
	Aq Qala	3,253	28,614	1,485 (tuna fish-warm water)	11,597	18	43,482
Total		**6,369**	**43,564**	**22,395**	**59,197**	**808**	**111,848**

Table 4: Agriculture Sector Production in Pol-e dokhtar, Ma'mulan, Aq Qala and Gomishan (sub-sectors)

Province	Town	Field Crops	Orchards	Livestock, Poultry, Aquaculture and honey bee
Lorestan	Pol-e dokhtar	33,707	20,575	3,631
	Ma'mulan	41,196	16,835	4,238
Golestan	Gomishan	111,146	227	60,497
	Aq Qala	3,253	1,703	43,482

Table 5: Expected income of the farmers for agricultural activities before the floods by sub-sector (per annum)

Province	Town	Field Crops		Orchards		Livestock, poultry, apiculture and aquaculture		Total	
		IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Lorestan	**Pol-e Dokhtar**	573	5.45	453	4.303	2,033	19.33	3,059	29.08
	Mamulan	700	6.66	370	3.521	2,373	22.56	3,443	32.74
Golestan	**Gomishan**	1,889	17.96	5	0.047	33,878	322.10	35,772	340.10
	Aq Qala	55	0.53	37	0.36	24,349	231.5	24,442	232.38
Total		3,218	30.60	865	8.23	62,634	595.48	66,718	634.31

5.3 Assessment of Disaster Effects

The spring floods of 2019 severely affected the agricultural production in the three provinces of Lorestan, Golestan and Khuzestan provinces. More 54,000 hectares of farm land and plantation was inundated in the floods (ref tables 11 and 12) It damaged agriculture and fisheries related infrastructure and assets such as green houses, Fish farms and apiaries, public pumping stations, wells, small canals and other structure to facilitate water distribution to agriculture farms. Horticulture crop production was badly hit reported highest damage to fruit orchards, affected all the three provinces. Furthermore, there is report of high incidence of death of livestock such as sheep, goats, poultry and cows in all three provinces.

Damages

The damages to the various sub-sectors in agriculture are shown in the following tables.

Table 6: Damages to productive facilities and buildings

Province	Town	Greenhouse		Livestock Buildings		Fish farms		Total	
		IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Lorestan	Pol-e Dokhtar	12	0.11	640	6	7	0.064	658	6
	Mamulan	N/A	N/A	443	4	5	0.044	448	4
Golestan	Gomishan	N/A	N/A	6	0.059	3	0.028	9	0.088
	Aq Qala	7	0.07	4	0.042	78	0.74	90	0.85

Table 7. Damages to irrigation assets

Province	Town	Water transferring canals		Distribution water pipes		Water reservation Pool		Total	
		IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Lorestan	Pol-e Dokhtar	54	0.50	16	0.15	4	0.038	74	0.688
	Mamulan	43	0.41	13	0.12	3	0.031	59	0.561
Golestan	Gomishan	41	0.39	N/A	N/A	N/A	N/A	41	0.39
	Aq Qala	35	0.33	N/A	N/A	N/A	N/A	35	0.33
TOTAL		173	1.63	29	0.27	7	0.069	209	34.639

Table 8. Damages to other irrigation assets

Province	Town	Agriculture water wells		Public Pumping Stations		Qanats		Total	
		IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Lorestan	Pol-e Dokhtar	16	0.15	177	1.7	3.5	0.033	196.5	1.883
	Mamulan	13	0.12	144	1.4	N/A	N/A	157	1.52
Golestan	Gomishan	N/A	N/A	25	0.23	N/A	N/A	25	0.23
	Aq Qala	N/A	N/A	16	0.15	N/A	N/A	16	0.15
TOTAL		29	0.27	362	3.48	3.5	0.033	394.5	3.783

Table 9. Damages to other agricultural assets

Province	Town	Personal motor pumps		Natural Resources, Facilities and earth dam		Roads connecting farms and Nomadic settlements		Total	
		IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Lorestan	Pol-e Dokhtar	1,435	13	427	4	360	3	2,222	20
	Mamulan	1,174	11	350	3	295	2	1,819	16
Golestan	Gomishan	N/A	N/A	N/A	N/A	26	0.24	26	0.24
	Aq Qala	N/A	N/A	N/A	N/A	149	1.4	149	1.4
TOTAL		2,609	24	777	7	830	6.64	4,216	37.64

Table 10. Summary of damages to the agriculture sector

Province	Town	Productive facilities and buildings		All irrigation assets		Other agricultural assets		Total	
		IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Lorestan	Pol-e Dokhtar	658	6	196.5	1.883	2,222	20	3,077	27.883
	Mamulan	448	4	157	1.52	1,819	16	2,424	21.52
Golestan	Gomishan	9	0.088	25	0.23	26	0.24	60	0.558
	Aq Qala	90	0.85	16	0.15	149	1.4	255	2.4
TOTAL		1205	10.938	394.5	3.783	4,216	37.64	5,816	52.361

Losses

Losses in the agriculture sector are in production decline and other unexpected expenses. The table below shows the damage to field crops and orchards.

Table 11: Damage to field crops and orchards sub-sectors

Province	Town	Filed Crops			Orchards			Total		
		Production (ton)	Price (Billion IRR)	Price (Million USD)	Production (ton)	Price (Billion IRR)	Price (Million USD)	Production (ton)	Price (Billion IRR)	Price (Million USD)
Lorestan	Pol-e Dokhtar	7,992	120	1.14	1,156	29	0.3	9,148	149	1.4
	Mamulan	11,544	173	1.6	1,669	42	0.4	13,213	215	2
Golestan	Gomishan	70,000	1,590	15.1	675	20	0.2	70,675	1,610	15.3
	Aq Qala	137,625	2,676	25.5	975	29	0.3	138,600	2,705	25.7

The production losses in livestock and poultry is shown below.

Table 12. Production losses in livestock and poultry

Province	Town	Livestock			Poultry			Total Value	
		No.	IRR (Billion)	USD (Million)	No.	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Lorestan	Pol-e Dokhtar	432	21	0.2	1,350	0.054	513	21.054	513
	Mamulan	528	26	0.2	1,650	0.066	627	26	627.2
Golestan	Gomishan	579	16	0.15	193,000	16	0.15	32	0.3
	Aq Qala	1800	45	0.42	1,350,000	240	2	285	2.42
TOTAL		3339	108	0.97	1,546,000	256.12	1142.15	364.12	1,143

For aquaculture and apiculture, the production losses are shown below.

Table 13. Production losses in aquaculture and apiculture

Province	Town	Aquaculture			Apiculture			Total Value	
		Amount	IRR (Billion)	USD (Million)	Colony	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Lorestan	Pol-e Dokhtar	0.9	3.5	0.033	900	0.15	0.001	3.65	0.034
	Mamulan	0.8	4.5	0.042	1,100	4	0.036	8.5	0.078
Golestan	Gomishan	6000 tons of shrimps	0.045	0.0004	50	0.03	0.002	0.075	0.0024
	Aq Qala	545	2.5	0.024	1,370	8	0.078	10.5	0.102
TOTAL		NA	10.545	0.0994	NA	12.18	0.117	22.725	**0.2164**

The table below shows the losses from other unexpected expenses.

Table 14. Unexpected expenses in agriculture

Province	Town	Cleaning of mud		Transferring water		Migration and rent of land		Added cost of transportation of livestock and apiculture		Total Losses	
		IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Lorestan	Pol-e Dokhtar	22.5	0.21	18.5	0.17	27	0.25	8	0.075	76	0.705
	Mamulan	16	0.15	13	0.12	14.5	0.13	8	0.077	51.5	0.477
Golestan	Gomishan	4.5	0.042	3	0.030	N/A	N/A	1	0.009	8.5	0.081
	Aq Qala	4	0.039	1.8	0.017	N/A	N/A	1	0.010	6.8	0.066
TOTAL		47	0.45	37	0.34	42	0.39	18	0.17	142.8	1.329

The total effects of the floods for the two provinces is summarized in the table below.

Table 15. Summary of damages and losses.

Province	Town	Damages		Losses		Total Effects	
		IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Lorestan	Pol-e Dokhtar	2,700	26	81	0.76	2,781	26.4
	Mamulan	2,313	22	56	0.53	2,369	22.5
Golestan	Gomishan	1,738	16.5	11	0.10	1,748	16.6
	Aq Qala	3,181	30	10	0.094	3,191	30
TOTAL		9,932	94	157	1.4	10,090	96

The effects of the floods affected the employment of farmers, both men and women as shown below.

Table 16: Number of flood-affected farmers in the two provinces

Province	Town	Affected employment		Lost employment		Total	
		Men	Women	Men	Women	Men	Women
Lorestan	Pol-e Dokhtar	241	2168	45	405	286	2573
	Mamulan	197	1773	23	387	220	2161
Golestan	Gomishan	483	4689	0	0	483	4689
	Aq Qala	573	5247	0	0	573	5247
TOTAL		1494	13877	68	792	1562	14670

In terms of employment income, the following table shows the amount of foregone income of the farmers.

Table 17. Expected decrease in income by farmers

Province	Town	Field crops		Orchards		Livestock, poultry, apiculture & aquaculture		Total	
		IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Lorestan	Pol-e Dokhtar	143	1.3	113	1	508	5	765	7.2
	Mamulan	175	1.66	92.5	0.88	593	5.6	861	8.1
Golestan	Gomishan	472	4.4	1	0.011	8,470	80.5	8,943	85
	Aq Qala	14	0.13	9	0.089	6,087	58	6,110	58
TOTAL		804.5	1,080	216	2	15,659	149	16,679	158

Table 18: Total value of the damages to production and infrastructures in the agriculture sector

Province	Town	Damages to field crops & orchards		Damages to livestock, poultry, aquaculture and apiculture		Damages to facilities and productive holdings (greenhouse, livestock holdings, Fish ponds)		Damages to infrastructures		Total damages	
		IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Lorestan	Pol-e Dokhtar	149	1.5	28	0.26	7	0.064	2,517	24	2,700	25
	Mamulan	215	2	34	0.32	5	0.044	2,059	19.5	2,313	21
Golestan	Gomishan	1,610	15	33	0.31	3	0.028	92	0.87	1,738	16
	Aq Qala	2,705	26	198	1.8	78	0.74	200	2	3,181	30
Total damage		4,678	44	293	2.7	92.5	0.87	4,868	46	9,932	94.4

5.4 Recovery Strategy & Needs

Based on the review of data and further discussions with national level counterparts of the Ministry of Agriculture Jahad in Tehran as well as during the PDNA training and agriculture working group, the identification of immediate and medium to long-term recovery needs and resilience building priorities has been possible. However, cost estimates are largely difficult to do, given the lack of details for different sub sectors. The below section reflects recovery needs of 25 flood-affected provinces of Iran based on the assessments conducted during different meetings with the departments of the Ministry of Agriculture Jahad and then in the next section, recommendations are made with respect to the provinces of Golestan and Lorestan as directly advised by the Ministry of Agriculture Jahad. Therefore, Needs are presented as recommended actions and next steps, with few cost estimates that were possible.

Immediate Recovery Needs

The immediate recovery needs are particularly focused on the next 12 months, i.e. preparations for the summer season 2019 usually starting in June/July, and the winter season 2019/2020 with harvest in May 2020. Seasonality and timing will be critical to facilitate speedy recovery and not lose the second cropping season of 2019.

Urgent support is needed to facilitate the drainage and discharge of remaining water from crop fields to enable the summer season cropping. An emergency soil assessment, including identification of solutions and recommendations should be facilitated, to support evacuation of water and address any soil quality and recovery considerations needed. The soil assessment should be facilitated in the three most affected provinces of Golestan, Lorestan and Khuzestan.

Given the critical situation of the affected farming population, close collaboration with the Ministry of Labour and Social Welfare, to design a concrete flood emergency agriculture sector safety net should be considered. Furthermore, the flood impact on farm labour and income opportunities, the agriculture safety net component should cover minimum income transfers to affected agriculture households until the second next harvest is completed, i.e. May 2020, or even November 2020 for those who will only be able to start cropping again in the winter 2019/20 season. Monthly minimum transfers should be provided, based on livelihood protection thresholds[1] to protect remaining livelihood assets, i.e. animals, equipment, land, from being sold or lost due to coping mechanisms. About at least 100,000 agriculture households[2] are estimated to be in need for the first 12 months of recovery. This could then be scaled down to 50,000 households, graduating those starting to crop in June 2019 and hence completing a second harvest in May 2020 already.

Additionally, the government credit and loan policy should be adjusted to provide an emergency support option. Current credit and loan facilities are heavy on administrative requirements and charge 20 percent and more interest, depending on size and investment plan. In an emergency recovery situation, it is impossible for disaster affected households to engage under these conditions. Considerations and arrangements for an 18-month emergency credit facility should be given, with low to no interest rates for those flood affected, and investment into agriculture inputs (i.e. seed, fertilizer for the next season) or maintenance (i.e. feed and vaccinations for remaining livestock). This would enable farmers to invest into their next season, without needing to sell any assets to buy inputs. In line with government plans for the Agriculture Insurance Fund compensation loans, the estimated resources from the government are reflected in the recovery needs calculation. However, considerations on the conditions of loans provided to farmers should be exercised based on suggestions discussed above.

In line with the follow up on the current and evolving needs, a Food and Nutrition Security Surveillance System (FN3S) should be established in the most flood affected

1. The livelihoods protection threshold should include allocations for 1. Minimum essential food and non-food basket; 2. Maintain access to basic services (e.g. routine medical and schooling expenses); 3. Sustain livelihoods in the medium term (e.g. regular purchase of seeds, fertilizer, veterinary drugs etc…); 4. Achieve a minimum locally acceptable standard of living (e.g. purchase of basic clothing, coffee/tea etc.). http://www.livelihoodscentre.org/-/how-to-define-and-calculate-livelihood-protection-needs

2. Current indications are that 2 million people are in need of humanitarian aid; with an assumption of 4 people per household, and agriculture making up about 20% of the labour force, 100,000 households can be estimated to be the most vulnerable agriculture households affected by the floods.

provinces. This should monitor the evolving household and community nutrition security situation until full agriculture sector productivity is re-established, and support the government and implementing partners to prevent deterioration of the household nutrition security situation, through enabled early action and response. The FN3S should be implemented until all flood affected areas have at least completed a second round harvest, hence i.e. October 2020, and could run in parallel with and inform the implementation and targeting of the emergency agriculture safety net component.

A crop and food assessment mission (CFSAM) should be facilitated as careful harvest measurement in all flood affected provinces in May 2020, to establish catch up production and yields at that time.

Overall, an estimated budget of IRR 9,900 billion or USD 94,121,674 is estimated for the remaining immediate needs in flood affected areas. Given the lack of detailed information, this indication might increase later.

Medium- to Long-term Recovery Needs

The medium to long term recovery needs have been grouped together, to address the needs for recovery and resilience building on national and sub-national level, in policy and practice.

The emergency agriculture safety net should continue until November 2020 harvest completion. However, it is estimated a proportion of households will be able to cultivate in May 2019 and November 2019, hence the proportion of households only cultivating a first season in November 2019 and then May 2020 will be reduced. It is hence proposed to continue with 50 percent of the households estimated into the last six months of safety net support, and equivalent of 50,000 households. Additionally, the social protection sector should address the general targeting criteria and registration process of the government subsidy system, as well as work on a shock-responsive social protection component.

Additional soil and land recovery activities will be needed to support the recovery of soils from the flood, as well as improving any disaster resilience in their management and usage. Detailed activities and estimated resources needs will be identified by the planned emergency soil and water assessment. However, the overall policy and practice of watershed management in the I.R. Iran should be reviewed and updated, and watershed basin level interventions be implemented. Two to three priority watershed basins should be identified to begin work on this matter, integrating all the necessary stakeholders on national and various provincial levels. Once learning and experiences are documented, the identified approach should then be scaled up further to remaining watershed basins.

Looking at the impacts on a number of agriculture sub-sectors, it is of critical importance to start working on the agriculture sectors' climate resilience as soon as possible. Estimates for suggested policy and practice development for the cereal and oilseed, livestock, fisheries and aquaculture, and horticulture sectors are suggested. Additionally, a climate-smart agro-forestry and reforestation policy and strategy should be considered and pilot projects commenced, to address the limited forest cover and issues with slope land erosion. Lastly, as a part of the climate resilient agriculture focus, the wetlands of Urmia Lake and Hoor-Al Azim should be looked at to promote the protection of wetlands and their biodiversity while building local community resilience against climate change.

FAO will start a process of reviewing and addressing the agriculture sectors' capacities for disaster risk management and climate change adaption. Review of national and selected province level agriculture development plans, as well as disaster risk management plans should be facilitated, to establish their respective integration of agriculture and disaster risk management. A number of technical trainings for the province and national level MAJ and relevant department teams will accompany this component, looking at vulnerability risk analysis, early warning systems, and early warning early action and damage and loss data systems.

Overall, an estimated budget of IRR 4,483 billion or USD 42,620,956 is currently estimated for the medium-to long-term recovery and resilience building needs for the I.R. Iran. Given the expected detailed soil and water assessment, this estimate might increase at a later point in time.

The table below shows the short-term recovery needs for agriculture.

Table 19: Short-term irrigation recovery needs in the two provinces

Province	Town	Repair of deviated canals for temporary transfer of water		Installation of water pipes		Dredging and re-opening of water canals		Immediate installation of pumping stations fields and orchards		Total	
		IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Lorestan	Pol-e Dokhtar	0.26	0.002	3	0.028	0.65	0.006	13.5	0.129	17.41	0.16
	Mamulan	0.17	0.001	3	0.028	0.53	0.005	9	0.085	12.7	0.12
Golestan	Gomishan	2	0.019	0.25	0.0023	15	0.14	0.60	0.005	17.85	0.16
	Aq Qala	2	0.017	0.30	0.0028	14.5	0.13	0.30	0.003	17.1	0.162
TOTAL		4	0.040	6	0.061	31	0.29	24	0.22	65.06	0.618

Table 20 Short-term infrastructure and production recovery needs in the two provinces

Province	Town	Re-opening of roads connecting the farms and nomadic settlements		Distribution of inputs and fodder to production units		Total	
		IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Lorestan	Pol-e Dokhtar	12	0.116	2.5	0.023	14.5	0.137
	Mamulan	10	0.095	1.3	0.012	11.3	0.1
Golestan	Gomishan	10	0.095	3	0.026	13	0.12
	Aq Qala	9	0.08	2.5	0.024	11.5	0.1
TOTAL		41	0.392	9	0.085	50.3	0.457

Based on the 2 tables above, the total short-term recovery needs are shown in the following table.

Table 21. Short-term recovery needs in the two provinces

Province	Town	Irrigation		Infrastructure and production		Total	
		IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Lorestan	Pol-e Dokhtar	17.41	0.165	14.5	0.137	31.91	0.3
	Mamulan	12.7	0.12	11.3	0.1	24	0.22
Golestan	Gomishan	17.85	0.169	13	0.12	30.85	0.2
	Aq Qala	17.1	0.162	11.5	0.1	28.6	0.2
TOTAL		65.06	0.616	50.3	0.457	115.36	1.09

Social and Economic Impacts of the Agriculture Sector (Lorestan and Golestan Provinces)

The following are possible direct and indirect impacts on agriculture productivity and household economy caused by a variety of flood effects expected:

- Many staple crops, wheat, barley, oilseed, have been affected in the three provinces. This will have a significant effect on the production/yield level, and with it on the availability of the crops for food processing. The impacts on wheat for instance will directly affect the availability and pricing of bread in the local markets, reducing households access to staple foods.
- Strategic crops, like beans, wheat and soybean are generally traded at a fixed price by the government, leaving very little margin for farmers' incomes, even in a normal year. Given the impact of the floods and the experienced damages to crops, the overall production and margin this year will be even lower, affecting farming households' income, purchasing power and with it food access.
- Given the loss of the winter crop harvest, there is an increased likelihood that the summer crop season will be affected too. Sowing usually starts in the beginning of June, with harvest being carried in around October. Agriculture inputs are usually financed and accessed through income generated from the winter crop yield and sale. In this case, farmers might be in need of other financial sources, and are exposed to take high interest rate loans.
- The majority of crops, horticulture, poultry, and fish-and aquaculture farms are subsistence farms, however a critical number is run as agri-businesses with up to multiple hundreds of labourers. In these cases, due to loss of production and income to the farm, labourers will be at risk of unemployment and loose seasonal or even permanent employment. This similarly can have a significant impact on households' income, purchasing power and food access.
- Similarly, the same agri-business owners will possible need to sell some of their remaining assets to assure protection of assets, i.e. selling livestock to be able to purchase feed and veterinary services for remaining livestock, or take emergency loans at high interest rates, which might expose owners to higher risks of financial defaulting and bankruptcy.
- Changes to the soil structure and fertility due to the flowing and standing waters could have larger and longer lasting impacts on the quality of farming land, especially for subsistence farmers. This could lead to significant investment needs for rehabilitation of soils, loss of yields in the future, and/or higher amounts of agriculture inputs needed. All these elements could have a major impact on the household economy, and food and nutrition security of affected farming families.
- Adversely, permanent damages to soil, land and assets might force farming and herding families to drop out form their original livelihood, and seek other alternative livelihoods and income sources. Potential increase seasonal or permanent migration might occur, exposing agriculture families to increased risk of poverty.
- Additional economic impacts might be experienced in the food processing sector, due to damages to processing infrastructure, and lack of capacity to repair or replace necessary machinery, as well linked to import limitations due to the sanctions. Again, this could lead to release of labourers due to low economic turnover and production volume, and could possibly influence the national market prices of selected products.

All of these elements are critical for the agriculture production and especially food and nutrition security of the people in the flood affected areas. Additionally, other provinces, that might be less or not affected by the floods, but who usually benefit from surplus re-distribution from other affected provinces, or food processing in the affected provinces, might be affected on a secondary level through shortages of foods and commodities, and increasing prices in their local markets.

Lorestan Province

1- Planning and installation of water pumps and public pumping stations in order to avoid damages in similar future disasters, considering that more than 1500 personal motor pumps and public pumping stations have

been damaged during the floods, the following actions are required to secure the motor pumps:

a) Pooling individual motor pumps into 75 big and common pumping stations
b) New and secure layout for individual motor pumps

2- Reconstruction and re-opening the damaged roads connecting the farms and nomadic settlements (pastoral)

3- Taking necessary measures to develop watershed management activities in the basin of Karkheh, Dez and Karoun Rivers

4- Securing the cold and warm water fish breeding ponds to prevent future damages (349 holdings)

5- Reconstructing and securing the damaged livestock holdings through the usage of low interest rate bank credits

6- Identifying new employments for 950 farmers whose land is has been totally destroyed and is somehow no more usable (productive) through the issuance of greenhouse certificate, tourism activities and cultivation of medicinal herbs

7- Utilizing the technology and data of remote sensing satellites in the amelioration of management:

a) Zoning and identifying the risks of the areas on the verge of hazards in agriculture sector
b) Contribute to the identification of damaged areas immediately after the disaster
c) Contribute to the accurate assessment of the damages imposed on flood-affected farmers through merging the produced data from the satellite and the available field data
d) Preparing cadastre maps of the agricultural lands in order to identify the affected farmers immediately after the disaster by merging the early warning information received from satellite

Golestan Province

1- Reviewing the directions of water flows leading towards the sea and repairing the exit canals (drainage canal 1 & 2)
2- Planning to control flood water and reserve them
3- Constant dredging of canals and rivers and water canals
4- Implementation of the drainage project for 280,000 ha of the lands in the province
5- Complete implementation of the project on development of orchards in steep lands
6- Constant monitoring of the stability of dams and water reservoirs of the province
7- Planning for training people by relevant authorities with the cooperation of NGOs
8- Creation of a complete database of the available resources in the province and the required resources in time of crisis, including: number of boats, number of heavy machineries, shelters, trained individuals and groups in the regions
9- Assessing new equipment from other parts of the world for controlling floods, at least in urban and rural residential areas and equipping the national and provincial Disaster Management Organization with improved and updated systems
10- To use international organizations and their expertise in case of severe and continuous disasters
11- Utilizing the satellite remote sensing technology and data in amelioration of management:

a) Zoning and identifying the risks of the regions on the verge of hazards for agriculture sector
b) Identifying the damaged areas right after the disaster
c) Accurate assessment of damages to the affected users by merging the data produced by satellite and the available field data
d) Designing cadastre map of farm lands in order to identify the affected users, immediately after the disaster by merging the data produced by satellite

Suggestions and Needs Lorestan Province (Pol-e Dokhtar and Mamulan)

Table 22: required funds for recovery strategy (Lorestan Province)

Needs	Procurement and distribution of pumps considering Building Back Better		Reconstruction, rehabilitation and building back better (building safer) the water canals and water transferring pipes		Reconstruction, securing and renovating clean units for livestock keeping		Reconstruction, renovation and securing the roads between farms, orchards, aquaculture farms and nomads		Creation of jobs and new activities as alternative livelihoods (greenhouse city, cultivating medicinal herbs, tourism and …)	
	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Required construction funds	2,200	21	180	1.7	N/A	N/A	320	3	130	1.2
Low interest bank credits	162	1.5	60	0.57	210	2	N/A	N/A	450	4.2
Funds for grants	100	0.95	N/A	N/A	30	0.28	12	0.11	90	0.85
Total	2,462	23	240	2.2	240	2.2	332	3.1	670	6.3

Table 23: Required funds for recovery strategy

Needs	Developing watershed management activities for soil protection and prevention of serious future floods damages		Rehabilitation of farm lands and orchards		Rehabilitation of fisheries		Total	
	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Required funding for reconstruction	650	6	8	0.074	2.5	0.023	660	6
Low interest bank credits	N/A	N/A	65	0.61	1.2	0.011	66	0.62
Funds for grants	N/A	N/A	12	0.11	0.20	0.001	12	0.11
Total	650	6	85	0.80	4	0.037	739	7

Golestan Province (Gomishan and Aq Qala)

Table 24: required funds for recovery strategy (Golestan Province)

Needs	Procurement and distribution of pumps considering Building Back Better		Reconstruction, rehabilitation and building back better (building safer) the water canals and water transferring pipes		Reconstruction, securing and renovating clean units for livestock keeping		Reconstruction, renovation and securing the roads between farms, orchards, aquaculture farms and nomads		Creation of jobs and new activities as alternative livelihoods (greenhouse city, planting medicinal herbs, tourism and development of orchards in steep lands	
	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Required construction funds	120	1	900	8.5	N/A	N/A	720	7	150	1.4
Low interest bank credits	1	0.010	80	0.76	20	0.19	N/A	N/A	200	2
Funds for grants	N/A	N/A	23	0.21	5	0.047	N/A	N/A	80	0.76
Total	121	1	1,003	9.5	25	0.23	720	7	430	4

Table 25: required funds for recovery strategy (Golestan Province)

Needs	Developing watershed management activities for soil protection and prevention of serious future floods damages		Rehabilitation of farm lands and orchards		Rehabilitation of fisheries		Total	
	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Required funding for reconstruction	700	6.6	5	0.047	13	0.12	718	7
Low interest bank credits	N/A	N/A	2	0.19	8	0.076	10	0.095
Funds for grants	N/A	N/A	1	0.009	4	0.038	5	0.047
Total	700	6.6	8	0.076	25	0.237	733	7

5.5 Assessment Methodology

No separate field assessment of the agriculture sector damage and loss was conducted as a part of the PDNA process. FAO drafted this report based on information received on damage and loss from the Ministry of Agriculture Jahad. The current report is the result of data collected and complied by the Ministry of Agriculture Jahad, Iranian Space Agency and the Plan and Budget Organization. All information on damages and losses in the agriculture sector that are presented in this report are directly received from the Ministry of Agriculture Jahad and hence the estimates for damage, loss and recovery needs based on the data received from the Ministry and has not been validated through field visits. The short, medium- and long-term recovery needs presented in the report is the outcome of discussions and reflections with MAJ between March and June 2019, as well as during the PDNA training and PDNA agriculture sector write shop.

Section 3

INFRASTRUCTURE SECTORS

6. Transportation

6.1 Summary

This report covers the Post-Disaster Needs Assessment (PDNA) for the Transportation sector (TR) based on the flood occurrence in the Islamic Republic of Iran in 2019. With 44 percent increase in rainfall compared to the last 50 years, heavy rainfall and subsequent floods and landslides have significantly affected northern, western and south-western parts of the Islamic Republic of Iran during March and April 2019. The floods and landslides caused extensive destruction to the transport sector such as: (i) roads damages, including shoulder damages, (ii) damages to bridges, (iii) damages to culverts and drains, (iv) damages to railways, (v) damages to airports, and (vi) damages to transportation infrastructures in three provinces of Golestan, Khuzestan, and Lorestan. Due to the continuity of heavy precipitation, the degree of flooding, and the occurrence of landslides, the disaster damages and losses varied geographically with about 14,000 kilometers of roads, 725 bridges damaged or destroyed throughout the three provinces.

There was a notable loss in revenue for both governmental and private sectors due to the interruption of operations during the flood. For instance, the interruption of transportation due to blockage of debris, flooding of roads, and destruction of bridges has eliminated access to cities and villages and resulted in the loss of lives as there were no temporary access to local clinics or neighboring cities and relief agencies became incapable of delivering aid. This has also interrupted the supply chain of essential goods. Furthermore, a massive number of people who were traveling via roads, planes, and trains during the Iranian New Year celebrations were stuck in roads or terminals and this has imposed a heavy loss on incomes during the high season.

According to the latest statistics by the Ministry of Roads and Urban Development (MRUD), the total assessed damages and losses to the public transportation sector in Iran is estimated to be around 22,061.84 Billion IRR (209.75 million USD). This amount does not include revenue loss as the distinct data for damages and losses are not available. In addition, the loss and damages to private sector cannot be estimated due to lack of reliable data. Although the detailed tables on the extent of damage for transportation sub-sectors and infrastructures and their unit costs are not reflected in this report, the damage and loss figures provided by the MRUD are based on detailed assessment of the impact. The damage and loss by province and type of transportation are illustrated in the table (1).

Table 1: Damage and loss by province (Golestan, Lorestan, Khuzestan)*

Province	Damage				Loss				Total Effects (Damage + Loss)			
	Public	Private	IRR (Billion)	USD (Million)	Public	Private	IRR (Billion)	USD (Million)	Public	Private	IRR (Billion)	USD (Million)
Golestan	3085.48	-	3085.48	29.33	826.43	-	826.43	7.86	3911.91	-	3911.91	37.19
Lorestan	8127.47	-	8127.47	77.27	1710.04	-	1710.04	16.26	9837.52	-	9837.52	93.53
Khuzestan	6212.03	-	6212.03	59.06	2100.38	-	2100.38	19.97	8312.41	-	8312.41	79.03
Total	17424.99	0.00	17424.99	165.66	4636.85	0.00	4636.85	44.08	22061.84	0.00	22061.84	209.75

*Note that since only three provinces are covered in this report, the total summary is understated.

The restoration of normal accessibility, connectivity, and mobility, and the improvement upon preceding conditions by the application of preventive measures with regard to Build Back Better (BBB) strategy are the recovery strategies of the road sector to avoid future similar damages. The reconstruction strategy for these roads is comprised of short-term interventions, such as clearing debris from road surfaces, the rectification of surface damages, and repairing traffic structures and embankments to facilitate and precipitate the restoration of normal transportation condition. Long-term interventions include reconstruction of structures – i.e. bridges, culverts, drains and retaining walls, railways, and the protection of embankment and slopes. Essentially, the long-term development objectives of the sector were affected or impacted to a larger extent, since the damages were severe and widespread.

There is a meticulously-defined strategy in place for recovering revenue losses due to such circumstances. The losses of private operators (if can be quantified) are going to be managed by the reduction of taxation, increase in subsidies, insurance policies and governmental partial-aid and the government operators' losses are going to be compensated indirectly through their annual operational budget and disaster funds received from the government. Some data has not been shared due to security issues. However, based on the information provided by the MRUD, some of the best practices worldwide, and analysis by transport experts from the MRUD, some recommendations for strategy and recovery have been provided to be implemented by respective sub-sectors through different periods.

6.2 Sector Background

The Transportation sector in the Islamic Republic of Iran is under the direct supervision of MRUD which is comprised of the following sub-sectors as its affiliated companies and organizations:

1) Ports and Maritime Organization (PMO)
2) Iran Railway Company (IRC)
3) Civil Aviation Organization (CAO)
4) Islamic Republic of Iran's Airline (Iran Air)
5) Iran's Airports and Air Navigation Company (IAC)
6) Executive Organization for Public and Government Buildings and Infrastructure
7) Roads, Housing and Urban Planning Research Center (BHRC)
8) Iran's Meteorological Organization (IMO)
9) Construction and Development of Transport Infrastructures Company (CDTiC)
10) National Land and Housing Organization (NLHO)
11) Iran's New Towns Development Corporate Holding Company
12) Roads Maintenance Organization (RMO)
13) Technical and Soil Mechanics Laboratory Company (TSMLC)
14) Iran's Housing Foundation
15) Iran's Urban Regeneration Corporate Holding Company

The Plan and Budget organization (PBO) statistical classification report for the transportation sector 2018 is as set out below in the tables (2), (3), and (4):

Table 2: Length of roads recorded by MRUD

Province	Freeway (Km)	Highway (Km)	Major Road (Km)	Secondary Road (Km)	Urban Road (Km)	Total (Km)*
Golestan	0	247	701	250	0	1198
Lorestan	104	385	742	645	52	1928
Khuzestan	135	1053	2673	1198	57	5059

*Note that roads under the supervision of municipalities and rural roads are not considered in this table.

Table 3: Length of railroads recorded by MRUD

Province	Major Railroad (Km)	Secondary Railroad (Km)	Total (Km)
Golestan*	400	70.5	470.5
Lorestan	156	35.4	191.4
Khuzestan**	407	55	462

* Golestan railroad is a subset of North Railway system which is reflected in this table.
** Khuzestan railroad is a subset of South and Southwest Railway systems which is reflected in this table.

Table 4: Number of travels and travellers recorded by MRUD

Province	Intraprovincial travels by the governmental transportation system		Interprovincial travels by the governmental transportation system	
	Number of Travels (Multiply by 1000)	Number of passengers (Multiply by 1000)	Number of Travels (Multiply by 1000)	Number of passengers (Multiply by 1000)
Golestan	297	3134	126	1511
Lorestan	242	2193	146	1823
Khuzestan	751	5281	174	2123

The pre-disaster key objectives of the MRUD are the implementation of the government's programs and policies in the following areas: (1) provision of the country's transport infrastructure, including roads, railroads, shipping lanes and airways, (2) administration of the country's transport affairs, establishing coordinated comprehensive transport policies, and to develop, equip, expand and maintain infrastructures according to requirements for social, economic, and national defense development, (3) construction, development, operation, and maintaining roads, railroads, ports, and airports and to evaluate their methods (4) evaluation of the country's requirements in terms of soil science services and identifying construction materials.

In response to the floods, between April 5th and 18th, MRUD dispatched three teams to these provinces to conduct emergency measures such as moving debris and opening roads and in some cases closing dangerous roads and bridges and perform assessments. In addition, in some cases that roads were covered by debris or completely destroyed fixations such as detours or bypasses were implemented to facilitate the transport and service provision temporarily.

6.3 Assessment of Disaster Effects

Damage

Based on the available data provided by the MRUD and its sub-sectors, the extent of damage on the transportation sector can be estimated in three target provinces. Flash floods began on 19 March in Golestan province, northeast of the country, resulting in the destruction of roads and railways in Aq Qala and Gomishan areas, downstream from Gonbad. Rockfall, landslide, and road closure were some of the damages in this province. Gorgan's airport has suffered from a IRR 2 Billion. damage. As roads had become flooded and mostly incapacitated, railroad was blasted in several locations by the authorities in order to create a water passage for the floodwater and this interrupted the railroad access. According to the MRUD, the total amount of damages to the transportation sector in Golestan was estimated at around IRR 3085 Billion.

In Lorestan province, the majority of roads and bridges in cities and districts of the province were affected by the rainfalls, *inter alia* Mamulan, Dorud, Khoramabad, Pol-e Dokhtar and Wisiyan. The flow rate of the Khoram Abad River increased from 400 cubic meters per second to 700, while the Tireh River in Dorud experienced a flow rate which increased from 380 to 550 cubic meter per second. Some of the roads, bridges, and transportation infrastructures were damaged beyond repair and required to be demolished. Pol-e Dokhtar and Mamulan are the most severely impacted counties. Around 57 bridges and culverts and 250 kilometers of major roads and highways were damaged. In particular, connectivity and accessibility to various cities and villages were lost because of the collapsed bridges and damaged access roads.

The rainfall in Khuzestan, which increased three-fold from last year, yielded a flow of 8.2 billion cubic meters into provincial dams in less than two weeks. Karkhe, Dez, and Karoon, the 3 main rivers breached their banks at various points, resulting peripheral roads and bridges becoming submerged in various degrees. There are no authentic data available in Khuzestan due to security reasons. However, it was stated that an airport has suffered slight damages and as a result of the overflow of dams, several roads were washed by flood and bridges were destroyed. Due to a lack of authentic information about the private sector's damages such as damages imposed on vehicular stock, they have not been reflected in this report.

Loss

Due to destruction of transportation infrastructures, Intraprovincial and interprovincial travels were heavily affected in the three provinces as people mainly stuck in roads and terminals. In addition, transport costs increased due to the use of longer bypasses. For instance, in Golestan, since roads were flooded, people had to use rafts or small boats to sail out of the location and then use other means of transportation. Furthermore, all transits and cargo loading processes halted for several days. This has only resulted in around IRR 200 Billion. of the total loss imposed to Golestan province.

In Lorestan and Khuzestan, people had to use longer bypasses or detours to access their houses and workplace or in some cases as a result of heavy destruction of bridges, they have lost their access to adjacent cities and villages.

In addition, economic losses were caused by the loss of connectivity, especially for the roads and bridges that were destroyed. This had resulted higher transport costs for people to move around the cities and in some cases meant people not being able to afford the access to workplace or markets for several weeks. It has to be mentioned that in Khuzestan, people were mainly evacuated from flood-prone zones prior flooding which caused less human casualties in this province. Private sector's losses have not been reported as there were no reliable sources available. Table 5 illustrates some of the roads blocked by the floods and their respective bypasses in Lorestan, Khuzestan, and Golestan.

Table 5: Roads blocked by flood and bypasses in Lorestan, Khuzestan, and Golestan

Province	Blocked Road	Bypass
Lorestan	Khoram Abad - Mamulan	Khoram Abad - Pol-e Zal - Chool Hool - Afrineh - Mamulan
	Khoram Abad - Pol-e Dokhtar	Khoram Abad - Pol-e Zal - Dehlij - Afrineh - Pol-e Dokhtar
Khuzestan	Shoosh - Ahvaz	Khosraj road
	Shadegan - Darkhoein	Gar Gar road
Golestan	Gomishan	Koreh Soo - Nardanli
	Aq Qala	Saghar Tapeh - Tomachler
		Gamishli Yilgay - Ghochjan Abad
	Gonabad- Aq Qala	Gandom Abad- Salman Farsi

Table 6: Damage and loss by sub-sectors in Aq Qala and Gomishan (Golestan) and Pol-e Dokhtar (Lorestan)

Sub-sector	Damage				Loss			
	Public	Private	Total Effects		Public	Private	Total Effects	
			IRR (Billion)	USD (Million)			IRR (Billion)	USD (Million)
Aq Qala								
Roads	618.01	-	618.01	5.88	12.14	-	12.14	0.12
Maritime	-	-	-	-	-	-	-	-
Airports	-	-	-	-	-	-	-	-
Railways	600.26	-	600.26	5.71	120.07	-	120.07	1.14
Total	1218.26	0.00	1218.26	11.58	132.21	0.00	132.21	1.26
Gomishan								
Roads	229.69	-	229.69	2.18	45.47	0.00	45.47	0.43
Maritime	-	-	-	-	-	-	-	-
Airports	-	-	-	-	-	-	-	-
Railways	-	-	-	-	-	-	-	-
Total	229.69	0.00	229.69	2.18	45.47	0.00	45.47	0.43
Pol-e Dokhtar								
Roads	3950.64	-	3950.64	37.56	750.36	-	750.36	7.13
Maritime	-	-	-	-	-	-	-	-
Airports	-	-	-	-	-	-	-	-
Railways	-	-	-	-	-	-	-	-
Total	3950.64	0.00	3950.64	37.56	750.36	0.00	750.36	7.13
Grand Total	5398.59	0.00	5398.59	51.33	928.04	0.00	928.04	8.82

Table 7: Damage and loss by sub-sectors

Sub-sector	Damage				Loss				Total Effects (Damage + Loss)			
	Public	Private	IRR (Billion)	USD (Million)	Public	Private	IRR (Billion)	USD (Million)	Public	Private	IRR (Billion)	USD (Million)
Roads	14989.09	0.00	14989.09	142.50	3736.64	0.00	3736.64	35.53	18725.73	0.00	18725.73	178.03
Maritime	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Airports	115.47	0.00	115.47	1.10	0.00	0.00	0.00	0.00	115.47	0.00	115.47	1.10
Railways	2320.43	0.00	2320.43	22.06	900.21	0.00	900.21	8.56	3220.64	0.00	3220.64	30.62
Total	17424.99	0.00	17424.99	165.66	4636.85	0.00	4636.85	44.08	22061.84	0.00	22061.84	209.75

Table 8: Public damage and Loss by Province and Type of Transportation*

Province	Damage		Loss		Total Effects (Damage + Loss)	
	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Golestan						
Roads	2482.03	23.60	501.24	4.77	2983.27	28.36
Maritime	0.00	0.00	0.00	0.00	0.00	0.00
Airports	3.15	0.03	0.00	0.00	3.15	0.03
Railways	600.30	5.71	325.19	3.09	925.49	8.80
Total	3085.48	29.33	826.43	7.86	3911.91	37.19
Lorestan						
Roads	7265.06	69.07	1385.03	13.17	8650.09	82.24
Maritime	0.00	0.00	0.00	0.00	0.00	0.00
Airports	112.32	1.07	0.00	0.00	112.32	1.07
Railways	750.10	7.13	325.01	3.09	1075.11	10.22
Total	8127.47	77.27	1710.04	16.26	9837.52	93.53
Khuzestan						
Roads	5242.00	49.84	1850.37	17.59	7092.37	67.43
Maritime	0.00	0.00	0.00	0.00	0.00	0.00
Airports	0.00	0.00	0.00	0.00	0.00	0.00
Railways	970.03	9.22	250.01	2.38	1220.04	11.60
Total	6212.03	59.06	2100.38	19.97	8312.41	79.03
Grand Total	17424.9890	165.6635	4636.8471	44.0836	22061.8361	209.7472

*Note that since only three provinces are covered in this report, the total summary is understated.

Social impact of damage and loss

The country's national transportation network, including expressways, roads, railways, etc. is considered to be a crucial economic infrastructure within the transport sector, providing high mobility, connectivity, and accessibility. Ergo, early recovery of the sector is vital for the economy to be built back as it was.

In the flooded rural areas of Lorestan, Khuzestan, and Golestan, access to markets via routes or roads became difficult or impossible due to the destruction of roads, debris on roads, and landslides. Food and water were delivered to these villages by boat and/or helicopters by the IRCS (Iran Red Crescent Society). In some areas, roads had to be closed down by authorities due to the high risk of rockfalls or landslides.

In Golestan, the only access to other locations was provided by rafts and boats. Hence, the access to markets, schools, and workplaces was affected. In rural areas of Lorestan, the markets were not functional and communities could not access markets in the cities due to poor road conditions and increase in prices. Similarly, in Khuzestan, the rural markets were not functional and communities struggled to access city markets due to poor road conditions and significant increases in prices.

In Khuzestan access roads and bridges to schools were in many cases destroyed and; therefore, disrupted the educational and working system for several weeks. In addition, due to lack of time and demographical distribution maps, it was impossible to consider gender factor in this assessment. In view of the environmental considerations contained in Article 23 of the National and

Governmental Land Acquisition Law for Manufacturing, Agricultural, and Non-Agricultural Projects, by the PBO[1], the cross-cutting issues regarding environmental impacts were not re-reflected in this report.

6.4 Recovery Strategy & Needs

In case the Build Back Better (BBB) strategies are considered, the reconstruction and rehabilitation phases during recovery phase provide an exclusive opportunity to increase resilience against future disasters by strengthening the institutional capacities of the government agencies to respond to disasters. This section recommends areas to highlight throughout the reconstruction phase to improve resilience and reduce risk.

- The restoration of connectivity is the **short-term recovery objective** to increase accessibility within and between the affected areas. Reconstruction needs include the reconstruction of roads, pavement structures, culverts, and bridges. Modular bailey bridges are being discussed by the government as a quick recovery option that can be deployed quickly in order to restore rapid connectivity.
- To develop more resourcefulness, transportation design regulations has to be modified in accordance with the flood zoning maps and safety principles to decrease future damages to roads, bridges, and transportation infrastructures and prepare backup supplies and infrastructures for flood-prone locations. In this regard, the qualitative and quantitative boundaries of the rivers have to be defined clearly.
- Development of emergency traffic plan for each road may facilitate the provision of essential rescue and relief services to the affected area. This may include regulations to control traffic by prevention of private vehicles entrance to the road network.
- Development of evacuation routes may facilitate evacuation aftermath. In many places affected by 2019 flood, lack of evacuation routes caused entrapment of local inhabitants.
- As for **mid-term recovery objectives**, roads need to be inspected, repaired, and reconstructed considering modified transportation design regulations to better withstand future floods. Furthermore, the integration of the drainage infrastructure and the road network system is of the utmost importance. The drainage infrastructure within the major and minor connection roads require rehabilitation and upgrading to reduce flood risks in the future. Construction of additional cross-drainage structures, including bridges, will also be necessary, replacing causeways, road embankments. Slope protection, the stabilization and improved drainage of hill slopes, and other protections to strengthen and increase the capacity of the drainage arrangements will be required as well. Regular maintenance of the transport, culverts and drainage infrastructures will assist the reduction of flood risk and enhance the resilience of the road network.
- Another mid-term plan can be the launch of an early warning system, along with providing assistance to construct such infrastructure at selected locations. The purpose of this project is to mitigate flood disaster targeting for A-class national roads as part of its basic infrastructure by implementing appropriate countermeasures in highland areas, thereby enhancing the security of the road network, and thus, safeguarding the lives of people. Robust pavement design must be implemented to avoid risks of flood and landslides. This can be done through utilization of high-grade concrete pavements, slopes with cohesive materials for higher stability, and geotechnical operations to increase slope stability and hinder rockfalls. For example, the MRUD and its sub-sectors have to identify and prioritize domains with the probability of landslide in the vicinity of roads and infrastructures and determine solutions to increase their stability.
- Risk information must become tangible and available to be generated and incorporated for planning purposes. When mainstreamed into physical, fiscal, and policy decision making at both the national

1. Any constructions, reconstructions, and repair of transportation systems and their infrastructures must take environmental considerations into account and avoid damage to natural environment unless human lives are in danger. In addition, Implementers of projects are required to establish at least 25% of the assigned area for planting to develop natural resources and comply with environmental regulations.

and subnational levels, Disaster Risk Management (DRM) and Disaster Risk Reduction (DRR) become more effective. Furthermore, as risks from disasters may sustain for long periods, DRR requires long-term visions. This vision must be provided using scientific analysis and considering the effects of hazards on infrastructural assets, their vulnerability, and associated risks of hazards. As a pre-disaster measure, the MRUD sub-sectors must have specific plans to utilize alternative solutions in case needed. This develops redundancy and increases the accuracy of recovery.

- Comprehensive coverage of insurance on all assets and installations of transportation sector such as roads and road infrastructures, ports, airports, and railways, will provide further thorough and detailed data about the damages and losses in the aftermath of the disaster and will ensure an accurate compensation and recovery procedure. For instance, mandatory insurance coverage of all ports, airports and their assets in Iran (which is considered obligatory by the MRUD) is one of the most successful examples of this policy. In the aftermath of the 2019 flood and despite a 1.095 million USD damage to airports, the Civil Aviation Organization (CAO) has claimed that would not require any compensations from the government and all the damage cost is going to be covered by the insurance. This has decreased the financial burden that could be imposed on the government.
- In the **long-term plan**, institutional strengthening is needed to enhance the transport asset management system and to have an effective approach to managing and maintaining the transport infrastructure network. In addition, clearer roles and responsibilities need to be assigned, alongside appropriate budgets to manage this.
- Ensuring liquidity by the development of the DRM financing instruments to confront natural disasters thoroughly. As Iran is particularly prone to severe hazards such as earthquake and flood, emergency contingency budget is set aside that allows the central and local governments to mobilize resources quickly for immediate relief and recovery. Developing a financial instrument that allows the smooth and efficient transition from immediate recovery into medium-term reconstruction efforts (for example, the rebuilding of infrastructure) may further improve the government's capability to deal with disasters and; therefore, increases the resilience of the country by decreasing disruption to services for the affected areas.
- Congruous design methods such as bridges that allow high flood waters to pass underneath is another aspect of modified transportation design. The Bailey bridge option also provides easy maintenance and repair that would enhance the Build Back Better (BBB) principle.
- Increase in the redundancy of roads, railways, and airports can help emergency response at the time of crisis. For example, in cases where roads are blocked by the disaster, contingency plans for alternative routes can play an essential role in the rapid development of alternative roads for necessary access.

Table 9: Short-term recovery needs (0-18 months)

Sub-sector	Program of Activity	Value		Responsible Agency
		IRR (Billion)	USD (Million)	
Road	- Repairs - Temporary bridges - Modified design regulations - Emergency traffic plans - Developing evacuation routes	3484.9978	33.1327	RMO, CAO, IMO, CDTIC, TSMLC, BHRC, Municipalities
Railroad	- Repairs - Modified design regulations	1393.9991	13.2531	IRC, IMO, CDTIC, BHRC
Airports	- Repairs - Modified design regulations	261.3748	2.4850	IAC, CAO, IMO, CDTIC, TSMLC
Maritime	- Modified design regulations	87.1249	0.8283	PMO, IMO, CDTIC
Total		5227.4967	49.6991	

Table 10: Medium-term recovery needs (18-36 months)

Sub-sector	Program of Activity	Value		Responsible Agency
		IRR (Billion)	USD (Million)	
Road	- Drainage (design, construct, and repair) - Robust pavement (design, construct, and repair) - Regular maintenance - Early warning system - Tangible and available Risk information - Stabilizing slopes - Improvement culverts capacities	6272.9960	59.6389	RMO, CDTiC, TSMLC, BHRC, IMO
Railroad	- Drainage (design, construct, and repair) - Robust pavement (design, construct, and repair) - Regular maintenance - Early warning system - Tangible and available Risk information - Stabilizing slopes - Improvement culverts capacities - Design modification	696.9996	6.6265	IRC, CDTiC, TSMLC, BHRC, IMO
Airports	- Robust pavement (design, construct, and repair) - Regular maintenance - Early warning system - Tangible and available Risk information	435.6247	4.1416	IAC, CAO, IMO, CDTiC, TSMLC
Maritime	- Regular maintenance - Early warning system - Tangible and available Risk information	261.3748	2.4850	PMO, IMO, CDTiC
Road infrastructures	- Drainage (design, construct, and repair) - Regular maintenance - Early warning system - Tangible and available Risk information	1045.4993	9.9398	BHRC, RMO, IAC, IMO, CDTiC, TSMLC
Total		8712.4945	82.8318	

Table 11: Long-term recovery needs (36-60 months)

Sub-sector	Program of Activity	Value		Responsible Agency
		IRR (Billion)	USD (Million)	
Road	- Asset management - Liquidity - Design methods - Redundancy	2613.7483	24.8495	RMO, CAO, IMO, CDTiC, TSMLC, BHRC
Railroad	- Asset management - Liquidity - Design methods - Redundancy	348.4998	3.3133	IRC, IMO, CDTiC, BHRC
Airports	- Asset management - Liquidity - Design methods - Redundancy	87.1249	0.8283	CAO, IMO, CDTiC, TSMLC
Maritime	- Asset management - Liquidity - Design methods - Redundancy	87.1249	0.8283	PMO, IMO, CDTiC
Road infrastructures	- Asset management - Liquidity - Design methods - Redundancy	348.4998	3.3133	BHRC, RMO, IAC,CDTiC, TSMLC, IMO
Total		3484.9978	33.1327	

6.5 Assessment Methodology

The Need assessment is a combination of direct observations, interviews and discussions, and information gathering from external stakeholders since access to respondents in the field was limited.

Six sub-sectors were directly involved in the inspection, data gathering, and assessment of this sector's report: (1) Executive Organization for Public and Government Buildings and Infrastructure, (2) Roads, Housing and Urban Planning Research Center, (3) Iran's Meteorological Organization, (4) Construction and Development of Transport Infrastructures Company, (5) Roads Maintenance Organization, (6) Technical and Soil Mechanics Laboratory Company.

Following the PDNA workshop, the designated participants of each involved sub-sector had the responsibility to prepare their data in accordance with the PDNA guideline and the excel file that had been formulated by the International Institute of Earthquake Engineering and Seismology (IIEES) in Iran (annex I). This was followed by a meeting of Q&A to form the final report based on the PDNA guideline. After the submission of the report and data to the PBO and their final control, they were supposed to be sent to the UNDP office for further assessment and final report arrangement.

The damage and loss assessment and statistics contained in this report stem predominantly from representatives of government authorities such as the MRUD sub-sectors namely the Construction and Development of Transport Infrastructures Company, the Roads Maintenance Organization, and UN agencies that were located in the assessment areas. Details of losses to privately-owned services were assessed based on the information provided by National Transport Commission, and respective passenger transport authorities. The rapid needs assessments were conducted in accordance with MRUD guidelines.

The primary impact was upon the road and bridge asset connectivity. The affected assets were located along the main flood corridor and other areas affected by the flood. The physical inspection identified defects on existing roads and bridges that may have occurred because of the flooding/storm and proposed recovery measures for a functional review of this section of the transport network that could enable planning of more functional solutions and (re-)design with more resilient options for recovery. The visual inspection mainly focused on the following:

- Identification of damaged road infrastructures which requires emergency works for temporary repairs with available funding
- Data collection including span and width of structures for the development of repair mechanisms with cost estimation to reinstate the structural integrity of all defective/collapsed bridges on build back better principles (BBB);
- Visual assessment of condition where the structures exist.

Rapid needs assessments conducted in the form of structured key informant interviews with local authorities, community leaders or representatives. Emergency market assessments conducted to assess market capacity in assessment locations during the emergency. In instances where access was limited or time constraints applied, in the absence of structured interviews, unstructured interviews were held following the same protocol of questions

The affected roads were mainly feeder roads that were not within the classified national road system; therefore, no data was available with the MRUD. The assessment of the impact of the disaster on the road infrastructure within the affected communities was carried out through visual inspection and assessment of the damage to the road infrastructure. During the assessment, the location of proposed new road structures, including culverts and bridges, was also identified and mapped out to improve on the overall performance of the network. The quantities of the proposed intervention were computed and unit rates applied to produce estimates of the cost of recovery and restoration works.

References

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7. Energy

7.1 Summary

The floods caused moderate damage to the energy sector in 3 targeted provinces in this report; Golsetan, Lorestan, and Khuzestan. Energy group can be divided to 3 sub-sectors: Oil and Petrochemical, Gas, and electricity. Oil sub-sector is not included in this report.

Apart from oil sub-sector, damage and losses in other sub-sectors mostly in the distribution were mainly caused by failure and collapsed in distribution lines, while damage in the transmission and substation was mainly caused by landslides. Notably, no long-term interruption of gas and electricity supply resulted from the damage to the transmission and substation infrastructure, and no damage was reported for the power generation/ plants infrastructure and main supply system. Almost all facilities and equipment are planned to be repaired and put back into temporary operation in the short term.

A medium-term priority should be the reconstruction of transmission towers and stationary equipment for electricity and pipelines and stationary equipment for gas sub-sector. Long-term recovery would be replacement of old and non-efficient power generation units and distribution grid in electricity and strengthening distribution network in gas sub-sector. Additionally, energy harnessing from renewable and sustainable sources which can launched locally and work in off-grid condition.

The total damage and loss for the energy sector is estimated at IRR 1319.7 billion (US$12.546 million) and recovery needs are estimated at IRR 162.5 billion (US$ 1.544 million) which is only calculated for electricity sub-sector.

7.2 Sector Background

Gas

Iran is the world's third producer of natural gas (5.1% of the world's total and 309 BCM); which is primarily used for domestic electricity generation or heat production.[1] It contains an estimated 1,187.3 trillion cubic feet (33,620 km^3) in proven natural gas reserves. In 2005 a large share of Iran's natural gas reserves were believed to remain untapped. About 62% of these reserves are located in non-associated fields.

- Production: 309 billion cu m
- Consumption: 295 billion cu m
- Exports: 13 billion cu m
- Imports: 3.9 billion cu m
- Proved reserves: 33.61 trillion cu m
- Potential number of clients: 23,335,595
- Number of city coverage: 1142
- Number of gas station (CNG): 2250

Electricity

Today Iran ranks 18th largest producer and 20th largest consumer of electricity in the world. A research by the Ministry of Energy indicated that 20,000 megawatts of capacity should be added in Iran in the next 5 years. In recent years Iran has put greater emphasis on participation of domestic and foreign investors in electricity generation sector, with projects underway to add 40,000 MWh more capacity to the national grid.

Plans are being made to convert from gas and steam turbines to combined cycles power plants (32% gas turbines and 29% CCPP) as well as an emphasis on natural gas production in order to meet their growing electricity demand and decreasing consumption of gasoil and Furness oil. Nuclear power and hydroelectric power are not focused on for the time being, but they are part of an overall strategy to meet electricity demands. The electricity sector is also heavily subsidized and mostly state-owned companies control power distribution, transmission and generation. In order to meet the demands of the electricity sector, however, Iran is beginning to look into private investment. The current, total installed capacity is 80,000 MW.

By 2018, the addition of new power plants established and capacity was increased around 20,000 MW more while peak load demand was around 57,000 MW. Of total amount, about 80 percent was based on natural gas, 10 percent on oil-Gasoil-Furness, and 10 percent on hydroelectric power and nuclear. However, in 2004 Iran opened its first wind-powered and geothermal plants, and the first solar thermal plant came online in 2009. Total installed capacity of renewable and sustainable energies is

1. https://en.wikipedia.org/wiki/Energy_in_Iran - cite_note-27

around 760 MW which is mostly harnessed from solar energy and wind turbines.

- Production: 311 billion kWh per year
- Consumption: 250 billion kWh
- Exports: 6.7 billion kWh
- Imports: 32.9 billion kWh
- Power per capita: 974 W
- Power generation per capita: 3756 KWh
- Consumption per capita: 3117 KWh

The Ministry of Energy (Electricity and water) and the Ministry of Oil, Gas and Petrochemical are the principal authorities for overall energy policy. These two main ministries have their own transmission and distribution organizations.

7.3 Assessment of Disaster Effects

Exceptional rainfalls since March 19 have flooded 1,900 cities and villages across Iran, claiming over 72 lives and causing hundreds of millions of dollars of damage in different fields. In Electricity sub-sector, power grid of 2,352 villages was cut off due to the recent floods which were mostly located in 3 targeted provinces including Golestan, Lorestan, and Khuzestan.

In gas subsector, services to 30,737 clients in 755 villages in Khuzestan, Lorestan, and Golestan were cut off due to damages in pipelines (distribution network). Pipeline disconnection was in 2 points for Khuzestan, 7 points for Golestan without any cut off and 260 points for Lorestan (including 44 cities and 711 villages). Additionally, the pipeline, which passes from Lorestan and Khuzestan provinces, was not damaged and gas export was running without problems particularly to Iraq.

Figure1: Three targeted provinces in energy sector

Damage

In gas sub-sector, there was no damage in natural gas generation fields or any other natural gas operated power plants systems. In mentioned 3 provinces, pipeline in gas distribution network was broken up in 270 points which was mostly because of landslides. Gas cut off in some points was deliberately to keep some area safe and avoiding explosion because of gas leakage.

Gas Damages

Table 1. Damages in Gas sub-sector by provinces

Region	Damaged distribution pipe line (KM)	Damaged pump stations and stationary equipment	Pipelines effected by flood in transmission	Number of clients in cut off	Number of cities cut off	Damage IRR (Billion)	Damage USD (Million)
Khuzestan	0	27	2	3,461	42	270	2.566
Lorestan	165	41	260	27,276	711	540	5.133
Golestan	2	19	7	0	0	50	0.475
Total	**167**	**87**	**269**	**30,737**	**753**	**860**	**8.17**

NOTE 1: Exchange rate has been assumed 105.183 from IRR to USD in all calculations.

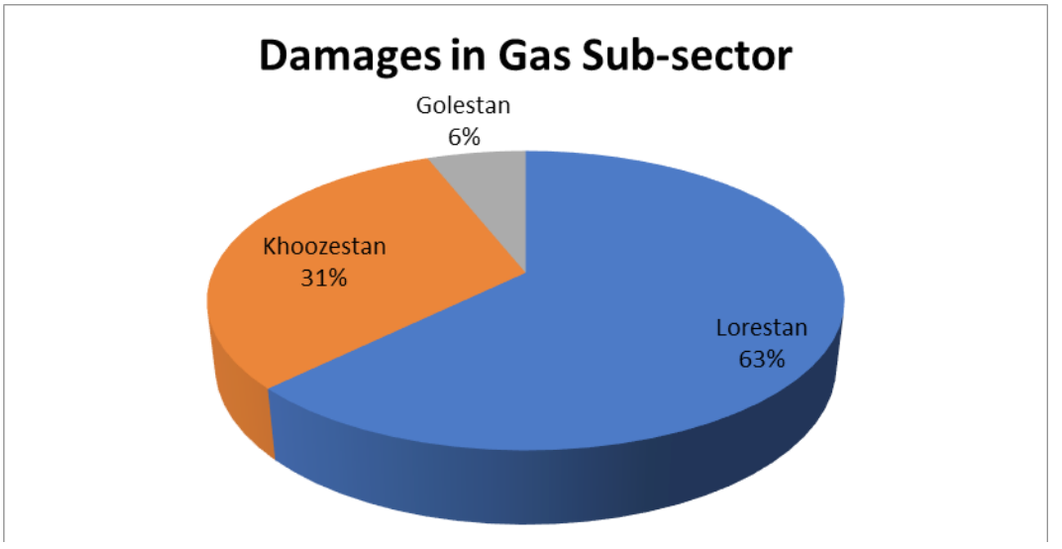

Figure 2: Damages in Gas sub-sector

In electricity sub-sector, the damage in the transmission and distribution was mainly caused by failure and collapsed towers in distribution lines as a result of the heavy rain and strong flood. Some posts and substations were also flooded because of heavy rains. Distribution grids in all 3 provinces had already been repaired temporary or permanently. There was delay in repair because of budget limitations, accessibility limited by road conditions, and a limited workforce, among other factors. Power generation units were not damaged due to recent flood in all 3 targeted provinces.

Electricity Damages

Table 2. Damages in electricity sub-sector

City	Province	Distribution				Tower/Rig and substation			
		Substation	Grid (KM)	IRR (Billion)	USD (Million)	Substation	Tower/ Rig	IRR (Billion)	USD (Million)
Shadegan	Khuzestan	5	**7.3**	**80.00**	**0.7606**	1	31	**8.30**	**0.0789**
Baamdejh		1	**1**	**1.70**	**0.0162**	NA	84	**124**	**1.1789**
Mamulan	Lorestan	31	**137**	**164.00**	**1.5592**	NA	NA	**0**	**0**
Aq Qala	Golestan	225	**186**	**82.40**	**0.7834**	NA	NA	**0**	**0**
Total		262	**331.1**	**328.1**	**3.1194**	1	115	**132.3**	**1.2578**

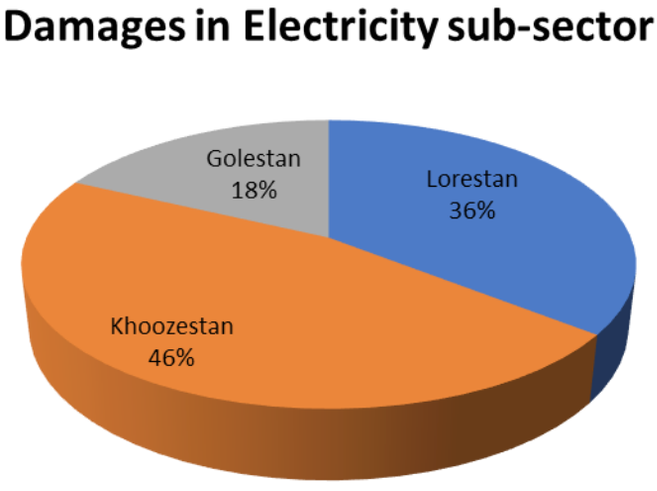

Figure3: Damages in electricity sub-sector

Loss

The calculation of losses takes into account reduced revenue, higher operational costs, and additional expenses from temporary needs (demolition, removal of debris) as a result of the disaster. According to estimates, losses from reduced revenue result from a projected reduction in sales.

NOTE 2: At the time of preparation of this report, Ministry of oil, gas and petrochemical has not provided losses parameters amounts for gas sub-sector.

Electricity Losses

Table 3. Losses in electricity sub-sector

City	Province	Reduced Revenue (MWh)	Electricity cut off in Residential clients (Number X Hour)	Electricity cut off in non-Residential clients (Number X Hour)	IRR (Billion)	USD (Million)
Shadegan	Khuzestan	85	NA	NA	0.0600	0.006
Baamdejh		10	1,350	750	0.0058	0.0001
Mamulan	Lorestan	13	240,000	71,000	0.0026	0.000024
Aq Qala	Golestan	6,000	6,700,000	120,000	4.7360	0.0450
Total		6,108	6,941,350	191,750	4.8044	0.051124

Social impact of damages and losses

The lack of energy services affected critical social lifelines such as hospital and water treatment as well as other public services. Lack of energy including electricity, or any other type of fuel like natural gas affected effective disaster response and recovery. Additionally, following impacts was observed:

- Health: No hospital services or clean water could be provided at the first hours of disaster.
- Environment: loss of electricity or natural gas resulted in using other types of fuels which are harmful for environment
- Education: Without electricity and gas, there was very low chance for schools to provide required services for their student even in lightening or heating/cooling systems
- Employment and livelihood: There were likely to be impact on employment on livelihood in provincial capitals due to the inability of industries to keep their working conditions. Shops, offices, or factories had to be closed due to loss of electricity or fuels.
- Food security: This one was directly affected very soon by lack of electricity to keep the food in proper condition. Cooking was also affected by lack of gas or other types of fuels.

Recommendations on protecting power systems against future hazards:

- Geophysics investigations and Identification of critical points according to natural disaster
- Strengthening of supports mechanism in distribution lines by considering possible land slide due to natural disasters
- Make ring lines for energy distribution
- Equipment and machineries Strengthening against natural disaster particularly floods and earthquake
- Regular inspection and services particularly on distribution

7.4 Recovery Strategy & Needs

Priorities of service restoration will be given to areas with highest economic and human impacts. These include:

- Economic activities such industrial zones, trading, agriculture, tourism and so on
- High density population and high energy consumption
- Social infra-structures like hospitals, schools, water treatment, refineries and power generation units
- Administrative services

Needs are defined as the activities that are intended to mitigate or avert the adverse impacts. They are reflected into short-, medium- and long-term, as shown the table below, to enable the planning and budget authorities how they can all fit in the multi-year budgetary allocation.

NOTE 3: At the time of preparation of this report, estimates were not provided by Ministry of oil, gas and petrochemical but these are needs discussed and agreed.

Table 4. Short term recovery needs in electricity sub-sector

Sub-sector	Program of Activity	Value	
		IRR (Billion)	USD (Million)
Electricity	Installation of slope protection, voltage sag reduction of conductors, and repair of tower foundations for transmission lines and making embanking damns	3.00	0.0285
	Flood control protection mechanism including changing flood path line, water channel for surface water	2.50	0.0238
	Auxiliary small-scale power electricity generation units	15.00	0.1426
	Stockpiling of spare parts and recovery equipment	30.00	0.2852
	Water channels to protect substations	2.00	0.0190
Total		**52.500**	**0.4991**

Table 5. Short Term Recovery Needs in Gas sub-sector

Sub-sector	Program of Activity	Value	
		IRR (Billion)	USD (Million)
GAS	Preparation of protocols for inter-organization (governmental) corporations for fast reactions and avoiding further damages	NA	NA
	Implementation of Satellite mobiles services	NA	NA
	Protocol and agreement with Fire –fighting, hospitals and Police as first aids	NA	NA
	Temporary strengthening of pipeline network to keep the services running	NA	NA
Total		NA	NA

Table 6. medium term recovery needs in electricity sub-sector

Sub-sector	Program of Activity	Value	
		IRR (Billion)	USD (Million)
Electricity	Reconstruction of transmission towers, power rigs and their foundation	30.00	0.2852
	Reconstruction of substations buildings and equipment	30,000	0.2852
Total		**60,000**	**0.5704**

Table 7. medium term recovery needs in gas sub-sector

Sub-sector	Program of Activity	Value	
		IRR (Billion)	USD (Million)
GAS	Installation of sight glass and monitoring systems for distribution pipeline which can be affected by any side slides or located close to the rivers	NA	NA
	Standardization based on HSE	NA	NA
	Identification of critical points and equipment Strengthening against natural disaster particularly floods and earthquake	NA	NA
	Regular participation in MDMO meeting to be alert against any natural disaster	NA	NA
	Preparation of higher level of corporation with other governmental organization to receive technical knowledge and information. This concept will be used to bring back better in distribution, pumping station and gas generation if any other consideration out of oil ministry area has to be taken into account like environmental accepts, geology and so on.	NA	NA
Total		NA	NA

Table 8. Long term recovery needs in electricity sub-sector

Sub-sector	Program of Activity	Value	
		IRR (Billion)	USD (Million)
Electricity	-Routing and implementing of power supply in residential and commercial sectors to be protected against floods -Rehabilitation and upgrade of old distribution system -Optimization and reconfiguration of distribution network to modify them in ring and mesh networks	50.00	0.4754
Total		**50.00**	**0.4754**

Table 10. Long term recovery needs in gas sub-sector

Sub-sector	Program of Activity	Value	
		IRR (Billion)	USD (Million)
GAS	Preparation of safety instruction for risky areas and optimization of applied stationary equipment and pipelines in areas which are assumed as high risk regions due to natural disaster	NA	NA
	Implementation of insulator and vent. systems	NA	NA
	Strengthening of supports mechanism in distribution lines particularly those exposed to be flooded or damaged because of heavy rains and sectional forces of rivers	NA	NA
	Preparation of check list for natural disasters	NA	NA
	Procurement of special machineries and equipment to be used in natural disasters	NA	NA
	Optimization of monitoring systems for fast reaction during natural disasters	NA	NA
Total		NA	NA

7.5 Assessment Methodology

In both electricity and gas sub-sectors, field studies have been done right after disaster by technical experts. Different teams from relevant ministries (Oil and power) have been sent for damage evaluation and planning for temporary remedy as soon as possible. In electricity and gas sub-sectors, distribution and substations are assumed as subject of damages and direct cost for partial or complete damage based on equipment and services in global price has been considered. No power plants or gas generation units have been damaged in recent flood.

For losses calculation, no information has been rovided by ministry of oil, gas, and petrochemical but in electricity sub-sector, the calculation of losses is based on reduced revenue in residential and non-residential clients by considering hours of electricity cut-off or mandatory shut down in each targeted province.

References

- Ministry of Oil, Gas and Petrochemical- Islamic Republic Of Iran
- Ministry of Energy – Islamic Republic of Iran
- Plan and Budget Organization – Islamic Republic of Iran

8. Water, Sanitation and Hygiene

8.1 Summary

Heavy rains, flooding and landslides in March and April 2019 have caused loss of lives, displacement and extensive destruction in the Islamic Republic of Iran. Twenty-five out of 31 provinces have been affected with Golestan, Khuzestan, and Lorestan most heavily hit. Water and sewer systems in the affected provinces have been severely destroyed/damaged, and an estimated 2 million people needed humanitarian assistance, where many of them were targeted for WASH sector emergency response assistance. Iranian authorities and the UN conducted joint field missions[1] in early April to the three most affected provinces Golestan, Lorestan and Ilam. A joint team also assessed impact and needs in Lorestan and Khuzestan. The Government of Iran, through its National Disaster Management Organization (NDMO) and relevant line-ministries, have gathered information on flood affected areas.

The net total value of damages and change in economic flows to the water and sanitation sector is estimated at IRR 17,771 billion**,** of which IRR 15,000 billion pertains to infrastructure and physical assets. The total needs for recovery and reconstruction using the principle of building back better is estimated at IRR 18,211 billion.

Table1: Summary of total damage, loss and needs of flood affected provinces – urban and rural

Provinces	Damage (IRR Billion)	Losses (IRR Billion)	Total Effects		Total Needs	
			IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Lorestan,	4,594	13	4,607	43	5,002	47
Khuzestan	12,349	22	12,371	117	12,350	117
Golestan	788	5	793	7	859	9
TOTAL	**17,731**	**40**	**17,771**	**168**	**18,211**	**173**

Short-term recovery activities will build on what has initiated during the early phase of the disaster while medium-term projects will be more focused on implementing the water safety plan, sludge management; building community and institutional capacity in disaster risk management with building back better techniques, among others.

8.2 Sector Background

The water supply sector in Iran is centrally controlled by National Water and Waste Water Engineering Company (NWWEC), an organization operating under the supervision of Ministry of Energy (MOE). The actual water supply service is provided by each of the provincial WWCs. Iran is a country with extremely limited water resources and effective use of water is one of the country's most important policy issue (Plans and Policies).[2]

Water and sanitation coverage in country, the JMP-SDG report 2017[3] shows that 92% of Iranians (nearly 72 million people, around 20 million of whom children) have access to safely managed drinking water supply. 4% of Iranians (nearly 2.76 million people, around 0.76 million of whom children) have access to basic drinking water supply. 2% of Iranians (nearly 1.5 million people, around 0.4 million of whom children) only have access to limited drinking water supply (SDG). 3% of Iranians (nearly 2.4 million people, around 0.7 million of whom children) only have access to unimproved drinking water supply (SDG), 0.3% of Iranians (nearly 0.08 million people, around 0.02 million of whom children) drink untreated water (SDG).

88% of Iranians (nearly 70 million people, around 19.3 million of whom children) have access to, at least, basic sanitation services.10% of Iranians (nearly 7.7 million people, around 2.1 million of whom children) only have access to limited sanitation services (SDG) 1.5% of

1. April 2019 UN flood Response Plan- Needs Joint Assessment
2. SEPTEMBER 2016 Data Collection Survey Report on water by NWWEC And JAPAN INTERNATIONAL COOPERATION AGENCY (JICA) NIHON SUIDO CONSULTANTS, Co., Ltd. Exeldea LTD
3. JMP-SDG report 2017

Iranians (nearly 1.1 million people, around 0.3 million of whom children) only have access to unimproved sanitation services (SDG) 0.5% of Iranians (nearly 0.43 million people, around 0.12 million of whom children) defecate in the open. Disparities exist between rural and urban service provision.

Figure 1. Water used in Iran by source and use (2016)1; A: Water Uses, B: Water Sources (Total water use is 93.3 billion m3/Year)

8.3 Assessment of Disaster Effects

Damage

The WASH sector was assessed geographically - by urban and rural flood hit areas. The summary findings from the WASH PDNA show that out of a total 95,628 water supply system in the 3 severely affected provinces, 12,332 sustained major damages and 83,296 were partially damaged and that approximately 10,000 toilets where partially or totally destroyed. Likewise, of the total 766 Km of water supply pipes sustained major damages, 64,093 m3 water reservoirs tanks, 152 pumping stations sustained major damages, 97 water boreholes, 24 water treatment plants and 68 water springs, were fully damaged and approximately 108 Km of waste water pipes were fully destroyed, likewise of the total 55 wastewater pumping station and 29 wastewater treatment plants were fully destroyed.

Loss

The aggregate losses in the WASH sector are generally from foregone income of the water systems, cleaning of debris, and other unexpected expenses from urban and rural water systems. The breakdown of the urban water supply caused major losses compared to rural water system because the urban water supply system components like treatment plants, pumping stations, water supply pipe network and house water connections were fully damaged. The service provider NWWEC was forced to supply water through tankers to their consumers which was a very costly operation. Losses to individual households were not estimated since it was difficult to assess because the main service provider is NWWEC.

The following table shows the summary of damages and losses of the urban area.

Table 2: Summary Table of Damage, Loss and Effect (Urban)

Province	Damages	Losses	Total Effects	
	IRR (Billion)	IRR (Billion)	IRR (Billion)	USD (Million)
Lorestan	2,811	7	2,818	23
Khuzestan	10,224	8	10,232	85
Golestan	401	3	404	3
TOTAL	13,436	18	13,454	112

1. Source: AQASTAT, 2016/Food and Agriculture Organization

For the rural flood hit areas, the following table shows the damages and losses.

Table 3: Summary Table with Damage, Loss and Effect (Rural)

Province	Damages	Losses	Total Effects	
	IRR (Billion)	IRR (Billion)	IRR (Billion)	USD (Million)
Khuzestan	2,125	14	2,139	20
Golestan	387	2	389	3
Lorestan	1,783	6	1,789	17
TOTAL	4,295	22	4,317	41

In terms of water and sanitation infrastructure systems, the following table identifies the infrastructure that were damaged, their cost of repair and reconstruction, and the losses incurred.

Table 4. Damage and Loss in Water & Sanitation – Urban & Rural

WASH Infrastructure	No. of Units	Partially damaged	Total Cost of Repair IRR (Billion)	Fully Damaged	Total Reconstruction Cost IRR (Billion)	Total cost (Repair + Reconstruction)		Losses	
						IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Urban Water systems	67,928	61,136	3,367	6,792	1,459	4,826	45	22	0.21
Rural Water Systems	27,700	22,160	2,156	5,540	1,899	4,055	38	18	0.17
Urban Sewage systems	21,133	15,886	3,703	5,247	4,907	8,610	81	0	0
Rural anitation (HH)	10,000	1000	24	9,000	216	240	2	0	0
TOTAL	**126,761**	**100,182**	9,250	**26,579**	8,481	**17,731**	**168**	**40**	**0.38**

8.4 Recovery Strategy & Needs

The recovery of the WASH sector will be a continuing set of immediate activities, thus, transcending the timeline for short- and medium- term recovery. These activities are interlinked and are intended to be completed in the shortest possible time since water is a vital human need that must be provided. As such, some activities for recovery may overlap between the short- and medium-term.

Short-term activities will build on the emergency response activities and run through end of 2019 giving priority to: temporary or provisional repairs to water systems; rebuilding of toilets facilities; resumption of the sewage systems; water treatment; water pumping station, water springs, water well restoring and strengthen institutional capacity to coordinate and implement short-term recovery needs; and undertake disaster preparedness measures. Rehabilitation of damaged projects will also be carried out during the period. The later phase in the short-term will include constructing of available and new water systems; implementing the water safety plan; resuming at-scale of the Social Movement for Sanitation; and implementing urban sludge management.

Medium-term recovery activities will be implemented from late 2020 with sharp focus on building back better with priority on building community and institutional capacity in disaster risk management; strengthening governance especially among service providers; strengthening sector monitoring, including for equity; and, completing the planned sector reform processes that are embodied in the NWWEC Development Plan.

The aggregate needs for the WASH sector summarized in the following table.

Table 5. Recovery needs

Type of Need	Description	Cost	
		IRR (Billion)	USD (Million)
Short-term	• Temporary or provisional repairs to water systems; • Rebuilding of toilets facilities; • Resumption of the sewage systems; • Water treatment; • Water pumping station, water springs, water well restoring and • Strengthening institutional capacity to coordinate and implement short-term recovery needs; • Undertake disaster preparedness measures • Rehabilitation of damaged projects	10,119	96
	• Continuation of rehabilitating and constructing of new water systems; • Implementing the water safety plan; • Resuming at-scale of the Social Movement for Sanitation; • Implementing urban sludge management;	5,541	53
Medium-term	• Building community and institutional capacity in disaster risk management; • Strengthening governance especially among service providers; • Strengthening sector monitoring, including for equity; and • Completing the planned sector reform processes that are embodied in the NWWEC Development Plan.	2,551	24
TOTAL		**18,211**	**173**

In summary, the total damages, losses and needs of the 3 provinces are shown in Table 6 below.

Table 6. Summary of damages, losses and needs of the WASH sector – urban and rural

Province	Damages	Loss	Total Effects		Recovery Needs			
	IRR (Billion)	IRR (Billion)	IRR (Billion)	USD (Million)	Short-term IRR (Billion)	Medium-term IRR (Billion)	Total	
							IRR (Billion)	USD (Million)
Lorestan	4,594	13	4,607	44	3,650	1,056	5,002	47
Khuzestan	12,349	22	12,371	117	11,300	1,350	12,350	117
Golestan	788	5	793	7	710	145	859	8
TOTAL	17,731	40	17,771	168	15,660	2,551	18,211	173

Reconstruction Strategy with Recommendations

The recovery and reconstruction strategy aims to return the sector to a better and more resilient state than the pre-flood status as quickly as possible, and enable it to resume progress towards restoring the national goal of universal access to water supply and sanitation. The strategy is not only intended to restore infrastructure and governance but also ensure that the sector as a whole is more resilient, that access to water and sanitation services are more equitable, that services are developed to a higher standard, that governance is strengthened through enhancing sector coordination, professionalism and accountability, and contributes to rebuilding of the nation. Implementation of the recovery strategy should be through existing sectoral policies and institutional arrangements, with coordination and strategic leadership provided by the MoE, NDMO and the Planning and Budget Office (PBO). Although the recovery strategy focuses primarily on the flood affected provinces, this should not be at the cost of slowing water and sanitation development in other parts of the country via the Sector Development Plan, as this will facilitate a more effective and efficient delivery of the recovery strategy.

To ensure that the recovery is effective, it is essential that roles and responsibilities, jurisdictions and resource envelopes are clearly established through consultation with key sector actors. This should set out the underlying principles of the recovery strategy, including the results-based management approach, monitoring and accountability. High-level technical and strategic guidance for the implementation should be developed at an early stage. Dedicated task teams should undertake this work under the coordination of the NWWEC with the overall guidance of the MoE, NWWC and PBO.

The implementation mechanism should seek to further strengthen the decentralization process and capacity building at local level to ensure that interventions are sustainable. To aid in this endeavor, it is recommended that the suggested framework on planning for recovery be considered when preparing more detailed recovery plans with detailed information from NWWEC which can be gathered by the sector partners.

Social and Environmental Aspects

1. **Gender and Social Matters.** Provision of short and medium-term accommodation arrangements should take into consideration gender differences. Separate arrangements and facilities should be provided for men and women especially the women, elderly and widow headed households. Moreover, social issues to be considered while formulating a reconstruction strategy (including water and sanitation infrastructure) comprise fair asset distribution, resettlement and livelihood options and preserving community infrastructure for successful implementation and operation of new and rehabilitated schemes.

2. **Solid Waste Management & Environmental.** Geographical conditions and the absence of adequate waste management practices pose a severe environmental problem. Safe and controlled disposal practices and designation of waste disposal zones should be immediately identified and communicated

to the water and waste water company in respected provinces, particularly in densely populated areas. Damage and loss in the WASH sector also encompass solid waste management, hygiene promotion and vector control. Data regarding the Solid Waste Management damages and losses were not available. However, it is recommended that be considered in longer development plans and in recovery strategy. The areas of destruction or damage to collection and management facilities such as collection and rubbish containers, central collection sites and the access to the sites, as well the destruction of the collection transport network such as trucks, motorized and handcarts (both urban and rural settings) and dumping sites (landfills) may sustain major or partially damages. The safe management of waste from health care facilities such as clinics and hospitals, should be addressed by Health sector.

The hygienic sanitation facilities (e.g. wastewater treatment plants, septic tanks, landfills) are pre-requisites for health and for success in the fight against outbreak of emerging-reemerging pathogens/diseases. In addition to the infrastructure issues created by the flood in its wake, floodwaters affected drinking water sources and sanitation facilities put the community at serious health risk. While the use of quicklime or super-chlorination may alleviate the issue, water pollution through sewage overflow/rising and contamination of ground water are the respective well-documented primary and secondary environmental effects of floods. Soil contamination should also be considered. While no water-related disease outbreak has been ever reported in affected areas, the risk of disease outbreak (e.g. cholera, scabies, and malaria incidents) continues to remain significant. Such health impacts in turn increase in health problems and corresponding increased health costs. Thus, the health sector must address the underlying problems of polluted surrounding environment.

Regarding environmental issues, Iran is a well-known hot spot country that was affected by climate change in recent years. While the floods cannot be solely assigned to climate change impact, not only the spatial distribution of precipitation but also the precipitation mode has been severely affected by the climate change (i.e. snow to intense rain) in the years to come. Some communities in Iran are prone to waterlogging and flooding due to increased raining. The floods of 2019 in these provinces and also other cities serve as warnings about the extreme events in the future. Accordingly, identification/ assessment of vulnerable communities and anticipating mitigation actions should also be considered.

3. **Hygiene practices.** In view of the loss of a large number of household latrines, appropriate communal sanitation facilities must be provided in the short term especially in Lorestan. In addition, hygiene education programs should be formulated to ensure use of toilets, washing hands and cleaning of the living environment.

4. **Community input** in the reconstruction process, especially for small schemes in rural area for the household's level, networks of smaller settlements within towns should be addressed. In addition, findings derived from the implementation of projects related to natural disasters have highlighted the need for integrating recovery and long-term development planning as well as population targeting that should be identified on a needs basis.

5. **Inter-sectoral coordination** is essential to adequately address the needs of the affected population and minimize implementation delays in the reconstruction process. Consistency with the housing sector strategy and overall approach is of particular relevance and shall consider the following principles:

- Water and sanitation services will complement predominantly in rebuilding and rehabilitation of housing.
- In areas where population is highly dispersed or damage is extensive and cannot accommodate pre-flood populations, design of replacement water and sanitation schemes will be considered with land readjustment schemes.

6**. Financial sustainability.** In addition to geographical location, the quality of engineering design and the quality of construction, quality of facility operation and maintenance can reduce vulnerability and positively contribute to disaster mitigation and preparedness. Improved scheme sustainability should be considered in the short to medium term, as well as in the selection of repair and improvement measures.

8.5 Assessment Methodology

The damages and change in economic flows for the water supply, sanitation and hygiene (WASH) have been calculated based on rapid assessments undertaken by National Water and Waste Water Engineering Company (NWWEC) and provincial Water Supply and Sanitation Offices in the three (3) severely affected Provinces where emergency was declared by the government. The NWWEC made estimates for three provinces, Lorestan, Golestan and Khuzestan that were classified by the government as 'severely' affected by the March & April floods. These assessments were validated based on the primary data gathered by the line Ministry of Energy (MoE) through field visits to 3 of the severely affected provinces by teams led by NWWEC, and the regional water supply and waste water department. In addition, consultations were held with representatives of relevant line agencies and development partners to better understand the effects of the disaster on the functioning of the water and sanitation sector and to solicit their suggestions on determining needs and formulating a recovery strategy.

9. Community Infrastructure

9.1 Summary

Community infrastructure are low-cost small-scale infrastructure built over time through community-led initiatives according to the needs of the community. The damage to such infrastructure was the greatest in the areas affected by 2019 floods, causing significant negative socio-economic effects at the local level. The floods destroyed the access routes to farmlands, interrupted supply of energy needed for local businesses and damaged the social networks. As a result, the production and services as well as social activities were affected which, if not addressed quickly, could significantly erode social capital. Livelihoods connected to tourism, guild and handicraft workshops (i.e. carpet weaving) in many rural areas have been affected due to damages to relevant community infrastructure by floods. For instance, in Golestan province, local carpet weaving industries have been affected by the floods due to damages to rural roads, local facilities and traditional workshops. In Lorestan some of handmade structures in the fish farms have been destroyed and caused further loss. In addition, the impact of flood on community infrastructure caused further difficulties (such as problems to have access to the necessary services) for the vulnerable groups (such as women, poor and marginalized, elderly, refugees, etc.), that should be addressed appropriately in the recovery of this sector.

Despite the importance of community infrastructure for the wellbeing of the population, the damage and loss suffered by this sector due to the 2019 floods have not been appropriately recorded. Damage and loss to specific elements of community infrastructure such as water and sanitation systems, access roads to farmlands/ markets, schools and health facilities, gas and electricity lines, handicrafts workshops, etc. have been accounted for in the respective sectors. However, damage and loss to other community infrastructure such as religious buildings and mosques, local shops and market places, wells, water storage structures, workshops' facilities, internal farm routes, etc. have not been captured by local authorities. Thus, it was not possible to accurately quantify the impact of floods on this sector.

However, given the importance of community infrastructure for the social and economic recovery of those affected by the floods, and to address those elements affecting recovery of community infrastructures from different physical, and socio-economic aspects, and in order to identify immediate risks to the affected communities (particularly new potential threats that may deteriorate conditions if the necessary measures are not taken in a timely manner), some recovery strategies to be implemented in short- to long-term are presented in this report. These include capacity building at local levels by raising public awareness and skills, involving local communities and developing highly participative approaches, formulating necessary mechanisms to support local people (especially vulnerable population), creating new economic opportunities, developing necessary database and inventories of the existing community infrastructure as well as promoting appropriate technologies for its improvement, in line with Building Back Better (BBB) approaches. These activities can be initiated with some seed money (around 12 million USD), and then can be completed by using local/ community resources and government support (table 1).

Table 1: Summary of the recovery needs

Recovery Cost							
Short-term		Medium-term		Long-term		Total	
IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
385	3.66	430	4.09	445	4.23	1260	11.98

9.2 Sector Background

Community Infrastructure refers to facilities and systems built at the community level that is socially, economically and operationally linked to lives and livelihoods of the community members. However, due to their rudimentary conditions, these structures are rarely registered in the official government records before disasters or damage to them assessed post disaster. Therefore, they are not addressed in recovery plans. This is the main reason that the impacts of 2019 floods on those infrastructure have not been taken into account by National Disaster Management Organization (NDMO) or other relevant institutions to make necessary intervention plans for post-disaster recovery.

Community infrastructure can be categorized into the following sub-sectors, as defined in the PDNA Guidelines developed by the UNDP, the World Bank and the European Union:

- Local connective infrastructure (farm roads, roads inside rural areas, footpaths within the community, etc.);
- Local protective infrastructure (such as farm drainage, small embankments and protection walls, etc.);
- Community centers and socioeconomic places (such as small marketplaces and shops, religious centers, grave yards, private schools and health centers managed by local people, etc.);
- Local water and sanitation facilities (such as small water tanks and supply pipes, shallow wells, etc.);
- Local energy and telecommunication lifelines (such as solar systems and similar community-driven low-cost energy supply systems, amateur radio, shared telephone lines, devices and systems).

In the provinces affected by 2019 floods, many of these community infrastructure existed prior to the floods, providing necessary services to local people and substantially improving productivity and quality of life in the communities. However, the community infrastructure is mainly labor-based traditional infrastructure, built using local materials with weak maintenance. Hence, most of them are vulnerable to rapid deterioration in the face of disasters, including heavy rains, floods or landslides. This is the main reason that most of the community infrastructure in the three provinces has been affected by the floods, though no reliable and comprehensive data has been gathered to quantify damages and loss to this sector.

Although the necessary data on damage and loss to community infrastructure is not available, examination of overall impacts of floods in the three provinces of Lorestan, Golestan and Khuzestan, may help to estimate the extent of damage to community infrastructure as well. In table 2, some basic data about the provinces affected by 2019 floods is presented.

Table 2: Some basic information about the provinces affected by 2019 floods*

Province	Number of cities	Number of cities affected by floods	Number of villages (approx.)	Number of villages affected by floods	Roads (km)	
					Total	Rural
Golestan	30	5	1000	56	4301	3103
Lorestan	25	11	3000	964	7053	5177
Khuzestan	77	4	4000	117	13536	8477

*Source: Ranking of Provinces According to Some 2016 Statistical Indicators (2019), Publications of Iran Plan and Budget Organization.

As demonstrated in this table, many villages in these provinces were affected by the 2019 floods. Therefore, it is expected that the community infrastructure in those places has been damaged significantly.

The existing situation at each sub-sector can be discussed as follows:

9.2.1 Local connective infrastructure

As shown in table 2, about 50-70% of total roads in the affected provinces by 2019 floods are rural roads. However, based on the Ministry of Road and Urban Development (MRUD), the rural roads are those that connect different villages to each other or to the cities. The impacts of disasters on those roads normally are evaluated by MRUD in transportation sector of PDNA. However, the damages to local access routes to farmlands and walkways are not taken into account by MRUD or any other sectors. These local routes are important to manage farmlands and determine the borders between different farms.

It is clear that destruction of those roads, not only would make it difficult to access the farms and reduce the productivity, but also may cause challenges in determining ownership and further socio-economic issues for the community members. Since the impacts of floods on these routes have not been assessed by NDMO, MRUD or other relevant institutions, the consequent damage and loss cannot be determined. Therefore, there is no mechanism to compensate damage to those infrastructures.

9.2.2 Local protective infrastructure

Similar to farm routes, protective infrastructure such as farm drainage, small embankments and protection walls are important for community members. They are normally built by local residents to protect farms, houses, local business, etc. Despite their significance to their owners, they are not documented and the impacts of flood on them have not been assessed by relevant authorities.

9.2.3 Community centers and socioeconomic structures

Although there are many public buildings owned by the government or public institutions in the provinces affected by 2019 floods (table 3), there is no data about the community-driven infrastructure. For instance, the local educational or health facilities inside communities that are handled by local residents normally are not recorded in the PDNA reports by the government institutions. Based on the forms provided by the Ministry of Education (MEDU) or the Ministry of Health and Medical Education (MOHME), damages to these local infrastructures are not considered in damage assessment, while they play important role in the affected communities. Local grave yards and religious facilities are also normally operated by the local people and have socio-cultural importance for the residents. However, the damages to these places cannot be recovered by communities without assistance from the local government. Similar issues exist for the infrastructure linked to small business such as local shops or small market places and are not normally addressed in livelihoods sector.

Table 3: Governmental and public buildings in the affected provinces by 2019 floods*

Province	Number of schools**	Number of religious centers (Mosque) ***	Number of sport complexes**	Number of libraries and cultural centers**	Number of Health Centers	
					Urban	Rural
Golestan	3607	2314	177	87	47	98
Lorestan	5404	1700	40	51	73	79
Khuzestan	9171	7500	52	244	180	112

*Source: Ranking of Provinces According to Some 2016 Statistical Indicators (2019), Publications of Iran Plan and Budget Organization

** These figures do not capture the community infrastructure.

*** This includes those religious centers (including Mosques and tombs of Imams, etc.) registered by the government. There are some other local religious places (such as small mosques, Hosseiniyeh, etc.) operated by local people and are not registered.

9.2.4 Local water and sanitation facilities

Although damage and loss to water and sanitation facilities is addressed in the Water and Sanitation sector, there are some local infrastructure owned by community members that are not listed in that sector and thus they are not considered by relevant authorities in the PDNA report. For instance, a number of water and waste-water wells inside the houses owned by communities are not precisely recorded. The floods filled most of those wells with mud and clay and rendered them useless, placing extra burden on the residents. This issue was more severe in Lorestan province (in Pol-e Dokhtar and Mamulan), where flash floods brought piles of mud and covered almost everything all around the affected areas. In addition, landslides caused by flood in Lorestan and Golestan also affected the community water systems that should be addressed in community infrastructure sector. Therefore, damages to water and waste-water wells as well as water tanks inside the farms or houses are important community infrastructure that should be addressed for the recovery of this sub-sector.

9.2.5 Local energy and telecommunication lifelines

While the impact of floods on the energy (electricity and gas) infrastructure is evaluated in the energy sector, there are additional energy-related facilities as well as telecommunication lifelines owned by community members in the affected provinces. These include solar systems, amateur radio, bio-gas and many other items that are important for the livelihoods of community members. The impacts of the flood on those elements have not been considered by the government and therefore no direct support might be provided to replace or repair them. Meanwhile the affected population may not have the necessary resources to repair or replace these items themselves. Although, the necessary data about these items has not been collected after the recent floods, information on these should be gathered by local authorities as an immediate priority and form the basis for governmental assistance to the community members to facilitate their early recovery.

9.3 Assessment of Disaster Effects

The 2019 floods had destructive impacts on community infrastructure in the provinces of Lorestan, Golestan and Khuzestan. However, as indicated earlier, most of the impact of floods on community infrastructure and its consequences have not been adequately recorded by relevant authorities. Therefore, quantitative assessment of the damage and loss in this sector was not possible. Damage and loss to specific elements of community infrastructure such as water and sanitation systems, access roads to farmlands/markets, public schools and health facilities, gas and electricity lines, main handicrafts workshops, etc. have been partially accounted for in the respective sectors. However, damage and loss to other community infrastructure such as religious facilities and mosques, graveyards, local shops and market places, equipment and hand-made facilities in handicraft workshops, water and wastewater wells, other small scale water storage structures, protective walls, small drainage infrastructure in farms, community driven energy and communication devices/facilities have not been captured.

In Golestan province, the floods affected five cities (including Aq Qala and Gomishan) and 56 villages, resulting in the evacuation and displacement of residents from 17 villages. Furthermore, 8 people were killed and 77 injured by floods. Many rural roads and routes to farmlands have been destroyed, water and wastewater wells filled with mud and clay. Local businesses were interrupted, and many workshops and their contents (tools, equipment, raw materials, finished/unfinished products) were destroyed. Besides damage to public infrastructure (power supply, roads, schools and health centers), community-managed structures and spaces (such as graveyards, religious facilities, etc.) have also been damaged. In some places, water wells have been polluted with waste water, thereby affecting the water quality and rendering it unsuitable for use.

In Lorestan province, 964 villages and 11 cities were affected by the floods and landslides. The flood killed 15 and injured 256 people and caused irreversible socio-economic impacts. Cities of Pol-e Dokhtar and Mamulan were damaged severely. In this province, many community infrastructure has been affected. For instance, 32 mosques and religious buildings have been severely damaged or destroyed by the flood. While data has not been gathered, many rural roads as well as routes to farmlands have also been damaged.

Many local educational and medical centers have been affected, some need to be reconstructed. In rural areas, the local shops and small marketplaces were damaged and local residents did not have access to markets for many days. This caused an increase in the prices of essential commodities. Additionally, damage to local business (such as fish farms, workshops, etc.) caused further difficulties for local residents.

In Khuzestan province, 4 cities and 117 villages were affected by the floods and many inhabitants were displaced. In this province 6 people were killed by the flood and 98 injured. While no accurate data has been gathered by relevant authorities, community infrastructure has been significantly damaged. Similar to Lorestan, due to damages to rural markets, the price of food and materials increased and this caused further difficulties for the survivors. There was significant damage to agriculture and livelihoods and would be discussed in the respective sector chapters of this report.

In the three provinces, it is expected that the damage to community infrastructure would have significant impact and consequences for local residents, such as the following:

1. **Water and waste water**: Access to clean/safe water was a main challenge after 2019 floods in many places. The flooding caused extensive damage to local water and sanitation wells and mixed clean water with waste water in many places. Hence, water is likely to be contaminated, with increased risk of water-borne diseases and outbreaks (such as diarrheal, cholera, shigellosis, rotavirus and Norwalk, etc.) that may result in higher fatalities. MoHME invested a large amount of resources to prevent those diseases and control the risk of transmission to other areas.
2. **Socio-economic impacts:** In all three provinces, the floods caused severe damage to local markets and bazaars especially in the rural areas. Such damage may affect spaces, buildings, equipment, etc. used for organizing local markets. As results, shortages of food, water and other essential goods caused many difficulties for residents. After a couple of the days, IRCS started to provide basic materials for the survivors, as discussed in DRR sector report. The floods also impacted livelihoods such as agriculture, which is the main source of income in rural areas. Jobs have been lost or diminished and many businesses have been affected, directly or indirectly.

   Livelihoods associated with handicrafts and tourism have also been severely affected due to direct damages to workshops, guesthouses, equipment and facilities or indirect damage to road network and reduced electricity supply, resulting in reduced income. Limited work opportunities (such as for drivers, seasonal labor, etc.) have also significant impacts on livelihoods of many households and caused shortage of income.

   Women, children, elderly, people with disability and some ethnic groups are expected to be affected more severely by this situation. It is worth mentioning that the flood also impacted refugees living in the affected zones, especially in Golestan province. Based on the report of the Afghanistan Embassy in Iran, in Gonbad city, 450 of the 700 Afghan households have been affected by the flood. UNHCR and Afghanistan Government have provided some support to them.
3. **Connective infrastructure**: Damages to rural routes caused difficulties to access farmlands, or other places inside the villages in rural areas. It also caused general slowdown in economic activity due to loss in productivity, and its negative impact on tourism and other sectors of the economy (such as carpet weaving). In addition, it may cause challenges on land ownership, as the local routes divide the properties of local people in some areas.
4. **Community buildings and spaces**: Due to damages to local educational and health centers, many people suffered from lack of necessary services after the flood. In some places, existing

facilities failed to provide necessary services due to structural and non-structural damages (such as damages to finishes, services and contents). In addition, many community-driven centers (mosques, graveyards, etc.) that have been affected by the floods could not provide necessary services in the aftermath of the floods. It is worth mentioning that the community buildings provide spaces to discuss and decide on actions that impact the community as a whole. An added advantage can be providing necessary space to act as safe meeting grounds and emergency shelters in case of disaster. In addition, the community buildings are critical physical component of rural landscape.

During the recovery and reconstruction phase, it is essential that a unified and comprehensive approach be followed for all community-level infrastructure. Since the effect of the flood could exacerbate the sense of isolation and abandonment among the vulnerable sections, including women, during recovery stage, those issues should be considered as a priority.

Community infrastructure provide important services to communities and therefore should be included in future post-disaster needs assessments. Baseline information such as an inventory of all community infrastructure developed prior to disasters will be crucial for effective assessment of damage, loss and recovery needs of the sector.

9.4 Recovery Strategy & Needs

The interventions for the recovery of community infrastructure should incorporate necessary measures to build back better (BBB). This usually means that services, infrastructure and governance mechanisms need to be rebuilt to a higher standard to make it resilient to future shocks. Community infrastructure such as those discussed earlier are extremely vulnerable to disasters. Therefore, in the reconstruction stage, necessary support should be provided to improve their resilience. In such a context, a broader concept of building back better is required – a concept that not only involves rebuilding damaged or destroyed community infrastructure but also its expansion to improve the access of marginalized sections of society, disadvantaged and vulnerable social and ethnic groups, PLWD, children, elderly and women. Hence, the expected recovery outcome is to put in place a network of community infrastructure that links all households and segments of population to national and district level services, infrastructure, markets and social development efforts, and to create equitable opportunities for social and economic development at the local level. Based on the above described vision, the community infrastructure recovery effort would require:

- Developing necessary databases and inventories about community infrastructure at local level, mapping of community assets, and understanding pre-disaster socio-economic local context for all communities, including minorities and refugees;
- Capacity building at the community level by developing a highly participative approach for planning, resourcing, monitoring, implementation, quality control and governance of community infrastructure, with strong and explicit mechanisms to involve all community members including the poor and marginalized sections, and women;
- Implementing appropriate approaches to promote social acceptance and ownership to involve local residents in recovery and maintenance of community infrastructure;
- Creating new socio-economic opportunities in areas, especially for those populations which need to be relocated (due to risk from landslides and floods);
- Promoting appropriate technologies that use local materials for flood-resistant construction of community infrastructure, and better management and creating demand for their effective operation and maintenance;
- Promoting understanding and raising local awareness of disaster resilient construction by community training and proposing measures to engage local people in a consultative process on how to effectively avoid the threats of future disasters and to protect the lives and livelihoods of the community;
- Skill development for communities in line with the new technologies to create resilient community infrastructure and sourcing local expertise to restore and upgrade the community small businesses;

- Ensuring access to community infrastructure for disadvantaged sections, groups with specific needs such as children and PLWD, and women;
- Developing and strengthening community-based groups to play a coordinating role to ensure that all communities and population groups have access to minimum infrastructure services;
- Involving specific groups, particularly women and other sections of the population in recovery of community infrastructure elements;
- Considering geographical and geological aspects in recovery of community infrastructure (i.e. away from sites prone to hazards);
- Promoting coordination with local institutions to facilitate organization and planning for PDNA and mobilizing resources in community infrastructure sector;
- Formulating necessary mechanisms to support local people in recovery of community infrastructure (by using low profit loans, technical assistance, etc.). It is proposed that funds be provided on a priority to communities that lack even the minimal set of facilities needed for their social and economic self-standing;
- Clearance of debris, restoration of water supply and sanitation facilities and opening up access to community sites (most work on this have been done by now by local people, but the remaining debris should be cleared in short-term);
- Elaborating general recommendations for reducing disaster risks including structural measures at the local levels (e.g. construction of small-scale flood control structures) through community participation approaches;
- Supporting small entrepreneurs to develop business contingency plans, etc.

In line with these programs and projects, there should be a streamlined approval, implementation, monitoring and reporting process for rapid fund disbursements in the interest of accountability and transparency. There should also be improved institutional mechanisms for operations and maintenance, including sustainable cost recovery. Priority is to be accorded to areas that are at risk from landslides and floods, and economic opportunities should be created for populations to relocate to safer places. Efforts should be made to promote suitable technologies, local materials and flood-resistant designs, and to incorporate the role of the private sectors at the three affected provinces (by building needed capacities at local level).

Some of these issues may be considered in the recovery plans and necessary budget be allocated through different channels including the Plan and Budget Organization (PBO) of Iran, local governors and municipalities, international donations, etc.

Table 4: Short-term recovery needs

Sub-sector	Program of Activity	Value		Responsible Agency
		IRR (Billion)	USD (Million)	
- Local connective infrastructure - Local protective infrastructure - Community centers and socioeconomic structures/sites - Local water and sanitation facilities - Local energy and telecommunication lifelines	- Organizing trainings and local activities to involve communities in recovery by developing highly participative approaches - Promoting social acceptance and ownership by considering the concerns of local people - Developing necessary basis for ensuring access to CI for all community members	85	0.81	Governor, Municipalities, IR Iran Broadcasting (IRIB), State Welfare Organization, Imam Khomeini Relief Foundation, Ministry of Economic and Financial Affairs (MEFA)
All sub-sectors	- Clearance of debris, restoration of water supply and sanitation facilities and opening up access to community sites - Formulating necessary mechanisms to support local people for reconstruction of community infrastructure - Promoting coordination with local institutions	300	2.86	- MEFA, NDMO, PBO, MRUD, MOE
Total		385	3.67	

Table 5: Medium-term recovery needs

Sub-sector	Program of Activity	Value		Responsible Agency
		IRR (Billion)	USD (Million)	
All sub-sectors	- Developing database and inventories of community infrastructure - Providing necessary data on geographical and geological aspects in recovery of community infrastructure - Involving specific groups (particularly women) in recovery of community infrastructure elements	250	2.38	PBO, MoE, MEDU, MoH, MoP, MoI, MRUD
Community centers and socioeconomic structures/sites	- Creating new economic opportunities - Skill development for communities - Developing and strengthening community based groups - Supporting small entrepreneurs to develop business contingency plans	180	1.71	Governor, MEFA, Municipalities, IRIB, State Welfare Organization, Imam Khomeini Relief Foundation, MCLS
Total		430	4.09	

Table 6: Long-term recovery needs

Sub-sector	Program of Activity	Value		Responsible Agency
		IRR (Billion)	USD (Million)	
- Local connective infrastructure - Local protective infrastructures - Local water and sanitation facilities - Local energy and telecommunication lifelines	- Promoting appropriate technologies - Capacity building at the community level by developing a highly participative approach - Elaborating general recommendations for reducing disaster risks	380	3.61	PBO, MEDU, MOHME, NDMO, MRUD
- All sub-sectors	- Promoting understanding and raising local awareness of disaster resilient construction by community training	65	0.62	NDMO, MPO, IRIB, MEDU, Governor, Municipalities
Total		445	4.23	

Table 7 presents the share of each province from the total budget proposed for recovery of Community Infrastructure. The proportions have been estimated based on the ratio of damaged villages at each province, assuming that most of the Community Infrastructure are exist in rural areas.

Table 7: Summary of short-, medium- and long-term recovery needs at each province

Province	Short-term		Medium-term		Long-term		Total	
	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Lorestan	323.4	3.07	361.2	3.43	373.8	3.55	1058.4	10.06
Golestan	23.1	0.22	25.8	0.25	26.7	0.25	75.6	0.72
Khuzestan	38.5	0.37	43	0.41	44.5	0.42	126	1.20
Total	385	3.66	430	4.09	445	4.23	1260	11.98

9.5 Assessment Methodology

It is clear that the damage and loss to community infrastructure have significant socio-economic impacts at community level and should be addressed in the recovery process. In order to evaluate the effects and impacts of 2019 floods on this sector, the main areas for data gathering have been determined based on available guidelines. Accordingly, an excel file was prepared to cover all sub-sectors. The file was distributed amongst relevant organizations in three provinces of Lorestan, Golestan and Khuzestan and necessary explanations were provided to them in a workshop organized by UNDP and PBO, early July, 2019. It was expected that the completed forms would be returned within two weeks of the workshop. However, as the required data was not collected immediately after the floods, most of the fields of excel file could not be completed by relevant agencies in due time. As a result, damage and loss could not be quantified in this sector. Therefore, in the second workshop organized by UNDP-PBO at the end of July, 2019 and based on discussions with national and international experts, it was decided to present recovery measures for community infrastructure that should be implemented in the flood-affected provinces in the short, medium and long term and to prepare a framework for PDNA in the community infrastructure sector to be used in the potential future disasters.

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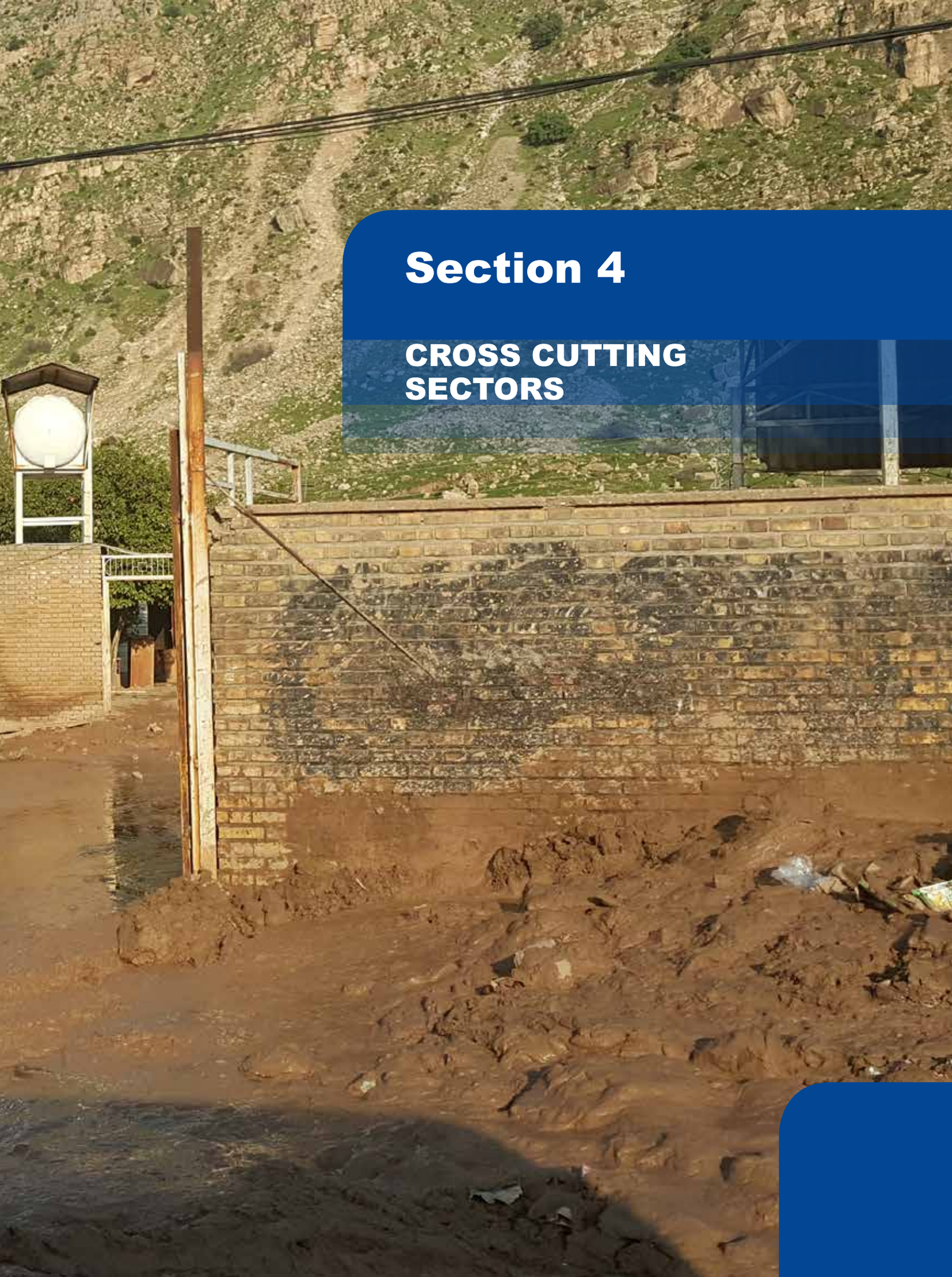

Section 4

CROSS CUTTING SECTORS

10. Disaster Risk Reduction

10.1 Summary

In this Chapter, the damage and loss from the 2019 Iran floods, and recovery needs of the Disaster Risk Reduction (DRR) sector for three provinces of Lorestan, Golestan and Khuzestan will be presented and discussed. According to the terminology of the United Nations Office for Disaster Risk Reduction (UNDRR), formerly known as UNISDR, DRR is defined as "the concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events". Therefore, DRR is a cross-cutting sector addressing broad perspectives related to recovery and response in many different areas.

However, this report only focuses on specific aspects of DRR in the context of Disaster Risk Management (DRM), as addressed in the relevant UN, European Union and The World Bank guidelines, including:

- Overview of Iran's DRM profile and structure, their related governing laws and regulations, and existing institutional arrangements;
- Evaluation of damage and loss related to DRR relevant buildings[1], infrastructure and assets, and services provided by DRR and DRM institutions to survivors and its challenges;
- Introducing necessary measures for capacity-building and resilient recovery needed to Build Back Better (BBB).

Based on data gathered from different sources about the above aspects, it was estimated that the 2019 floods caused IRR 3654 billion (USD 34.74 million) in damage and IRR 4887 billion (USD 46.46 million) in loss to the DRR sector in the three provinces.[2]

Finally, based on PDNA, the most important recovery interventions to be implemented in the provinces affected by the floods in short, medium and long-term have been addressed. Some of those measures include strengthening the early warning systems, capacity building and promoting preparedness at the national, provincial and community level, preparing emergency response plans for different institutions, preparing initial action and standard operation plans, implementing necessary measures to prevent additional damage and loss, managing existing risks as well as the new risks that have emerged due to the floods.

The total budget needed for early recovery and BBB as well as capacity building in DRR sector is approximately around IRR 7750 billion (USD 73.68 million) to be allocated between 1 to 5 years. It should be noted that the cost of implementing DRM and DRR measures related to mitigation, preparedness, emergency response and reconstruction aspects should be also addressed in other sectors, as they have not been counted in the above mentioned figures.

Table 1: Summary of Loss and Damage in three affected provinces

Province	Damage		Loss		Total Effect (Damage + Loss)	
	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Lorestan	2218	21.09	1497	14.23	3715	35.32
Golestan	654	6.22	1518	14.43	2172	20.65
Khuzestan	782	7.43	1872	17.80	2654	25.23
Total	3654	34.74	4887	46.46	8541	81.20

1. Governor office, local offices of line ministries, monitoring stations, etc.
2. Calculated based on the exchange rate of 1 USD = 105183 IRR

Table 2: Summary of Short-, Medium- and Long-term Recovery Needs

Recovery Cost							
Short-term		Medium-term		Long-term		Total	
Rial (Billion)	USD (Million)	Rial (Billion)	USD (Million)	Rial (Billion)	USD (Million)	Rial (Billion)	USD (Million)
1135	10.79	2485	23.63	4130	39.26	7750	73.68

10.2 Sector Background

In order to evaluate the baseline information on DRM and DRR in the provinces affected by 2019 floods, the following key aspects were considered:

A. Legal Background

According to the existing laws and regulations of I.R. Iran and the draft Disaster Management (DM) Bill that will be enacted after approval by the Parliament and the Guardian Council, National Disaster Management Organization (NDMO) headed by the deputy of the Ministry of Interior (MoI) is the responsible agency for planning, coordination and supervision of DRR and DRM[1]. This organization was established in 2008 by upgrading and re-organizing the Disaster Management Taskforce (DMTf) and has offices in each province to manage relevant activities at all levels, under the governor-general. At the county level, the county-governor is responsible for DRM and DRR, under the supervision of provincial NDMO office. However, different institutions have also some roles and duties in DRR as well as providing necessary services to the population affected by disasters. For this purpose, different taskforce committees have been established according to the existing laws and regulations under NDMO, each headed by relevant institutions. The duties and responsibilities of those institutions are clearly mentioned in the aforementioned laws and its practical guidelines. Figure 1 depicts the hierarchy of disaster management in Iran.

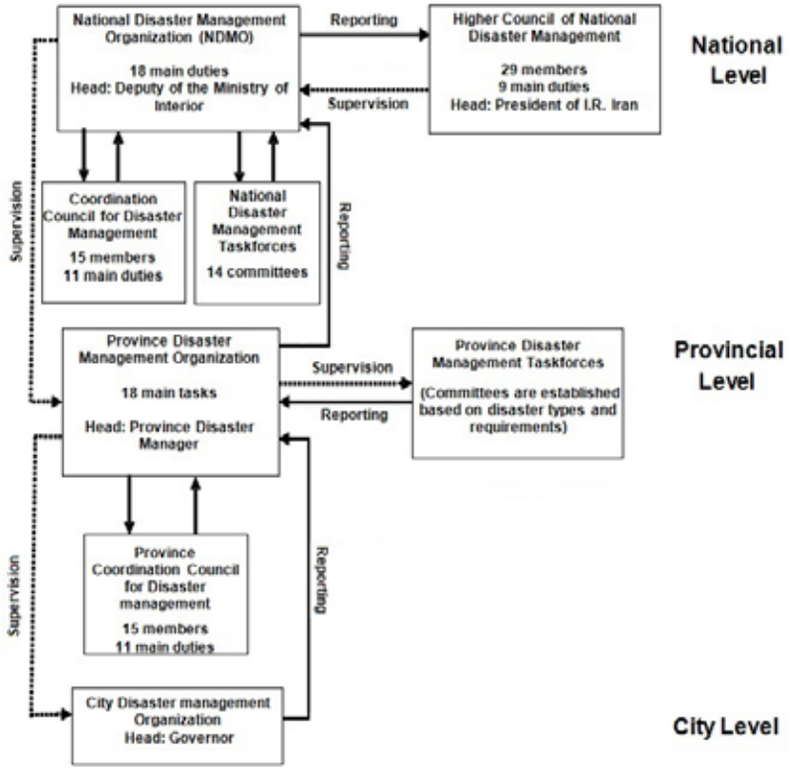

Figure 1. Disaster management structure in I.I. Iran

1. In Iran, DRR activities are considered as key elements of DRM. Therefore, based on existing laws, NDMO is responsible to coordinate and supervise DRR activities. However, the line ministries are responsible to implement necessary activities to reduce disaster risk in their territories. In addition, the budget for DRR activities is allocated by PBO.

Before 2008, NDTf was the responsible authority to provide necessary emergency response services in the aftermath of a disaster. By establishment of NDMO, most of the personnel of NDTf were moved to NDMO. Therefore, although in the law of establishment of NDMO, there are many phrases addressing the DRR and preparedness subjects, but still the focus of NDMO is mainly on emergency response. This can be considered as the main challenge for coordination and supervision of DRR activities from national to local levels by NDMO. Accordingly, before the 2019 floods, no systematic approach for reducing disaster risk and management of the necessary activities for DRR can be addressed in the affected provinces by the disaster. This shows the importance of capacity building at NDMO at different levels to play the anticipate roles for this organization based on the approved law.

B. Forecasting and early warning

The unprecedented rainfall during March and April 2019 resulted in flash floods (especially in Lorestan). In Golsetan and Khuzestan many urban and rural areas were inundated by overflowing rivers. Based on reports presented by Iran Meteorological Organization (IMO), in the areas affected by those floods, many hydro-meteorological equipment and weather stations as well as river water flow-meters were installed. According to NDMO, three days before the floods, IMO sent different warnings about potential floods to NDMO and its local offices. Thus, the evacuation order was issued using different means including SMS, dissemination of information through the media as well as using loudspeakers or face to face communication with residents to leave their houses (especially in Lorestan). In addition, the roads towards the risky zones were closed to minimize exposure of people to floods. Therefore, the number of casualties was much less than the similar events experienced before. It should be mentioned that information dissemination approaches have been tested by DM authorities few times before this flood, specifically in Lorestan for providing early warning to potential disasters. Those practices helped the authorities to make in time decisions, significantly.

Although those measures were effective in reducing the casualties, shortage of necessary equipment especially those needed for early warning (including rain gauges, river flow-meters, etc.) and lack of a comprehensive system to integrate different data to provide more reliable warnings were big challenges. This caused delay in evacuation (in some places the evacuation started just few hours before the flood and people were reluctant to leave their houses in many places to protect their property). In addition, there was no participatory plan to facilitate information dissemination or early warnings amongst the local people.

C. Risk assessment and mitigation

According to the existing data, all three provinces did not have multi-hazard maps that could be used to facilitate risk-informed development and land-use planning (including preparation of master plans for urban and rural areas). A few small scale hazard maps that have been prepared for some specific hazards (such as for earthquake) cannot be used for planning and implementing risk reduction measures. Therefore, lack of multi-hazard maps is a main concern in all affected provinces that should be addressed. Similarly, lack of sufficient information about topography, hydrodynamics of rivers as well as other necessary inventories resulted in improper and delayed decisions on potential risks.

Similar to other provinces, the flood-affected provinces did not have any guidelines and codes for construction of building and infrastructure exposed to multiple hazards. A review of the damages to structures in the flood-affected provinces revealed their high physical vulnerability to floods and earthquakes. In addition, there have been widespread violations of zoning regulations, with construction in floodplains and around rivers. Many formal and informal settlements have been constructed inside or in the vicinity of river beds in all three provinces. While, some of them have been destroyed by the floods, some others created bottle necks and changed the river flow regime and increased the impact of the flood water.

It is also necessary to evaluate the additional risks imposed to some places by the floods and heavy raining. For instance, the heavy rains increased the risk of landslide in Doroud (Lorestan) and Minudasht (Golestan). Now, several buildings and infrastructures are exposed to the risk of landslides in these places that need urgent interventions for reducing potential risks. Occurrence

of landslides in those places may cause irreversible casualties and economic damage. These secondary hazards are also addressed in PDNA report.

Issues related to maintenance and management of dams also contributed to the flood impact. According to the data provided by relevant authorities, many incomplete dams exist in the provinces affected by the 2019 floods. Upon completion of those dams, large volume of water could be stored, reducing the floods power and volume. For instance, if Narmab Dam in Golestan were completed before the floods, about 30% of flood water could have been stored in its reservoirs and the impact of the flood reduced drastically. Similar figures are available for Aq-Dakesh dam in the same province. In Lorestan, the construction of Mahshoreh Dam could have saved the Pol-e Dokhtar city from the floods.

Improper water resource management was another issue that increased the impacts of the floods. For example, based on data presented by local authorities, in early March 2019 (before the floods), reservoirs of Golestan, Vashmgir, and Bustan Dams were at 100%, 100% and 70% capacity respectively. If the water from those dams were discharged before the floods, excess volume of water from the rainfall could have been stored by those dams, thereby reducing the impact of the floods.

Finally, the improper flood control measures (both structural and non-structural) also contributed to the widespread destruction caused by the floods. For instance, along the Gorgan-Roud River in Golestan, the improvement measures (by flood walls or other river bank protection measures) have been implemented only in 55% of its river bed. In addition, lack of effective dredging decreased the cross section of the existing rivers, causing the rivers to overflow.

D. Preparedness

Although the impacts of the flood were unexpected, the preparedness level in all affected provinces was found to be insufficient. People were not aware of the risk of flood and many houses and infrastructure have been built on the river bed (especially in Lorestan province). Lack of public awareness was not limited to construction in unsafe locations. Even after flood warnings were issued, many people did not leave their houses and as a result exposed themselves to the floods. In addition, some of the local authorities and DRM officials were not prepared to confront with the impacts of the floods. For instance, lack of heavy vehicles and necessary machineries for debris removal, opening the blocked roads or preventing the flood waters from spreading further were reported by many sources. Additionally, no considerable efforts had been made in the affected provinces to increase resilience at local level or to inform and prepare people on how to respond to or mitigate the impacts of potential hazards. This exacerbated the negative impacts of the floods in many areas. In addition, in the affected provinces by 2019 floods, there were no CBO or NGO active in disaster management to be motivated in improving public awareness and emergency response.

E. Emergency response

Based on the existing laws and regulations, different organizations have some roles and responsibilities in emergency response and providing necessary assistance to the victims after disasters. Amongst 14 specialized working groups defined in the NDMO law, almost all of them are directly or indirectly involved in emergency response including:

1. Telecommunication Working Group (headed by the Ministry of Information, Communication and Telecommunication , MoICT);
2. Health and Medical Services Working Group (headed by the Ministry of Health and Medical Education, MoHME);
3. Drought, Blizzards and Agricultural Hazards Working Group (headed by the Ministry of Agriculture Jahad, MAJ);
4. Transportation, Lifelines and Weather Related Disasters Working Group (headed by the Ministry of Road and Urban Development, MRUD);
5. NGO's Working Group (headed by the Ministry of Interior, MOI);
6. Insurance, Recovery , Reconstruction and Firefighting Working Group (headed by the Ministry of Interior, MOI);

7. Security Working Group (headed by the Ministry of Interior, MOI);
8. Flood, power, sanitations and Marine Disasters Working Group (headed by the Ministry of Energy, MOE);
9. Fuel and Gas Supply Working Group (Headed by Ministry of Petroleum, MOP);
10. Earthquake and Landslide Working Group (headed by the Ministry of Road and Urban Development, MRUD);
11. Reconstruction and Temporary Shelter Working Group (headed by the Housing Foundation);
12. Environment Hazards Working Group (headed by the Department of Environment, DOE);
13. Media and public Awareness Working Group (headed by Islamic Republic of Iran Broadcasting (IRIB);
14. Rescue and Relief and Public Education Working Group (headed by theIRCS).

For instance, the IRCS has the responsibility in Rescue and Relief Working group and should provide search and rescue services in the aftermath of a disaster and is also responsible for supplying emergency shelters, food and water to the survivors. There are other institutions who are members of rescue and relief working group. Therefore, after the 2019 floods, many professional groups from the IRCS as well as other members of Rescue and Relief Working Group such as army, police, health sectors, etc. were dispatched to the affected areas to provide necessary services. However, the coordination amongst those institutions was a big challenge.

Lack of initial action plans and Standard Operating Procedures (SOP) for different institutions at different levels was another challenge. This caused delay in providing necessary services to the victims and also ambiguity in activities of different groups and stakeholders. In addition, there were no plans to involve volunteers dispatched to the flood affected provinces in appropriate places based on their skills. Similarly, lack of appropriate plans for receiving and distributing public donations was another challenge.

F. Disaster recovery and reconstruction

In Iran, the Housing Foundation is the responsible institution for reconstruction of residential buildings. Normally, after each disaster and based on the extent of the damaged areas, HF provides appropriate services to the victims and help them to make their buildings using the assistances provided by the government. For this purpose, normally the government allocates some low-profit loans as well as some grants. These resources can be used only if the owners obey the procedure approved for the reconstruction. According to reports provided by the HF at different stages, the loan will be dedicated if the progress of reconstruction follows the standard procedures. However, it should be noted that the recovery of business and social affairs is not normally considered as a priority after big disasters and this normally causes some socio-economic challenges in the affected areas by disaster.

10.3 Assessment of Disaster Effects

In order to assess the effects of floods on DRM buildings, infrastructure, equipment (machineries, monitoring systems, etc.) and personnel, the necessary data have been gathered through available sources and then analyzed. For the buildings and infrastructure, the detailed data about damaged police and fire stations, IMO offices, hydro-meteorological stations, as well as other DRM related buildings and equipment was not collected separately. Therefore, the damage and loss figures have been evaluated, collectively. In addition, number of vehicles and machineries damaged by the flood and those that were used in the aftermath of the disaster for emergency response were not available in details. Therefore, approximate costs are presented in this report. Similar challenge exists about number of personnel involved in emergency response, including those dispatched from other provinces. Based on the existing reports, different governmental, public, military (army and revolutionary guards) as well as volunteer groups got involved in providing necessary services to the victims in the affected areas. However, the total number of personnel that were involved in different provinces was not provided by relevant institutions. Therefore, the impacts of floods on human resources were estimated based on the available data, approximately.

Regarding the use of equipment to manage the response activities, the existing reports depict that during the first couple of the days after the floods, shortages of heavy vehicles and machineries was a big challenge in all three provinces. Of course, the Ministry of Road and Urban Development (MRUD) and other relevant organizations dispatched further equipment and machineries to remove debris, open roads and re-installing temporary bridges after few days. For instance, in Lorestan the number of machineries and vehicles involved in providing necessary services has been presented in table 3.

Table 3: Number of cars, trucks and other machineries used after the 2019 floods in Lorestan

Type of vehicles and machineries	Number	Type of vehicles and machineries	Number
Tank trucks	176	4WD cars	747
Bus and minibus	26	Excavators	128
Trailer trucks	133	Crane and lift trucks	95
Trucks	714	Ambulances	28
Utility vehicles (Bobcat)	64	Bulldozers	80
Cars	893	Graders	69
Vans	58	Loaders	203
Sludge trucks	15	Roller truck	3

Insufficient capacity for managing the conditions in the aftermath of floods was another issue that should be addressed. Although IRCS was involved in providing necessary assistance to the victims in the affected provinces, the requirements were higher than what was distributed based on the capacities of IRCS. Table 4 demonstrates the provided emergency items to the survivors by IRCS in three provinces of Lorestan, Golestan and Khuzestan.

Table 4: Distributed relief items by IRCS

Province	Tents (No.)	Food package (No.)	Nylon protector (Kg)	Tent Linings (No.)	Blanket (No.)	Bread (No.)	Canned food (No.)	Water (bottle)	Stove (No.)	Hygienic package (No.)
Golestan	6967	74245	14790	17561	40021	85971	71282	241875	1570	11128
Lorestan	15317	53244	6962	14641	47573	603445	31614	162116	2417	34907
Khuzestan	27307	103892	20162	30660	52150	1094770	176550	318508	7028	69010

Although the assistance provided was quite significant, due to the extent of the flood-affected regions, many survivors did not have access to the services, especially during the first couple of the days after the disaster. In addition, the distribution of goods and providing necessary services was not appropriate in many places (especially at rural sites) due to lack of inventory of disaster losses and outdated baseline datasets. This caused further challenges for the victims. In many villages, people did not have access to sufficient shelter, food and clean water for a few days.

In order to provide quick access to the villages away from the main roads, the rescue teams of IRCS, army and Sepah (Revolutionary Guards) provided aerial relief services, as summarized in table 5:

Table 5: Aerial relief services

Province	Flight hours	Sortie flight (No.)	Dispatch airborne (Material) (kg)	Dispatch airborne (Personnel) (No.)
Golestan	232	456	273000	1838
Lorestan	291	709	320000	2908
Khuzestan	327	604	158000	1484

The other issue that emerged in the aftermath of the floods was the inadequate insurance coverage of assets. Although some buildings and properties were covered by some types of insurance, but after the flood the government started to provide some grants and low profit loans to all victims. This was around IRR 100 million as grant and IRR 400 million as low-profit loans in rural areas and IRR 120 million as grant and IRR 500 million as low-profit loans in urban areas for reconstruction to those who lost their houses after the floods and around IRR 50 million grant and IRR 150 million low-profit loans to those with damaged houses. In addition, IRR 50 million as grant and IRR 150 million as low-profit loans was considered for the content for each household. For each hectare of farm or garden, the government also allocated IRR 20 and 50 million grant, respectively. Moreover, there were some grants for other sectors, as well. This was due to insufficient penetration of insurance in many regions. According to the data published by Central Insurance of Iran, amongst the lost capital in Khuzestan only IRR 1640 billion of total loss have been covered by 1887 insurance certificates. In Golestan and Lorestan this was 821 and 688 cases; covering 750 and IRR 550 billion, respectively. This shows a very limited amount of the loss and damage have been covered by the insurance. Therefore, efforts should be made to promote coverage of insurance at the local level, including through the development of appropriate solutions catering to clients from a wide range of socio-economic conditions.

Damage and Loss Tables

For the PDNA, in three provinces of Lorestan, Golestan and Khuzestan, damage to the following DRR assets were assessed:

Table 6: Description of different DRR sub-sectors

Type	Description
DRR buildings	Police and fire stations, IMO offices, hydro-meteorological stations, DRM related buildings (such as Governors offices)
DRR equipment & infrastructure	Equipment, emergency electricity, facilities, etc. belongs to DRM buildings and IMO stations
Relief items	Tents, Food packages, blankets, water, etc.
Vehicles and heavy machineries	Heavy vehicles and machineries used for providing rescue and relief assistance
Personnel	Those involved in providing emergency response
Services	Aerial relief services, ICT, arrangement and governance (such as coordination networks between local residents and authorities),

Estimation of loss took into consideration additional costs incurred to provide uninterrupted essential services due to the damage suffered by the above mentioned assets and services. This included costs related to:

temporary use of other buildings (rent, retrofitting expenses), temporary use of equipment, replenishing the stock of relief items that were distributed, renting of machinery, direct and indirect payments to personnel dispatched from other provinces, and additional services (such as airborne services, ICT in DRR such as dispatching portable mobile BTS to the affected areas by the floods, etc.).

Based on existing data, damage and loss related to different sub-sectors of DRR has been estimated in three provinces of Lorestan, Golestan and Khuzestan. The results are presented in tables 7 to 9.

Table 7: Damage and Loss in DRR Sector in Lorestan

Sub-sector	Damage			Loss		
	Governmental and Public	Total Effects		Governmental and Public	Total Effects	
		IRR (Billion)	USD (Million)		IRR (Billion)	USD (Million)
DRR buildings	Offices, DRR buildings*	1820	17.30	Temporary usage of other buildings	24	0.23
DRR equipment &infrastructure	IMO equipment, emergency electricity and facilities, etc.	88	0.84	Temporary usage of equipment or repairing costs	8	0.08
Relief items	Storages	0	0.00	Distributed relief items	330	3.14
Vehicles and heavy machineries	Cars and trucks, etc.*	310	2.95	Renting and repairing	575	5.47
Personnel	Casualties	0	0.00	Direct and indirect Payments	270	2.57
Services	Arrangement, governance, etc.	0	0.00	Others (airborne services, ICT in DRR, etc.)	290	2.76
Total		**2218**	**21.09**		**1497**	**14.23**

* The costs for covering damages were already approved to be allocated by the government.

Table 8: Damage and Loss in DRR Sector in Golestan

Sub-sector	Damage			Loss		
	Governmental and Public	Total Effects		Governmental and Public	Total Effects	
		IRR (Billion)	USD (Million)		IRR (Billion)	USD (Million)
DRR buildings	Offices, DRR buildings*	340	3.23	Temporary usage of other buildings	5	0.05
DRR equipment &infrastructure	IMO equipment, emergency electricity and facilities, etc.	74	0.70	Temporary usage of equipment or repairing costs	3	0.03
Relief items	Storages	0	0.00	Distributed relief items	390	3.71
Vehicles and heavy machineries	Cars and trucks, etc. *	240	2.28	Renting and repairing	740	7.04
Personnel	Casualties	0	0.00	Direct and indirect Payments	150	1.43
Services	Arrangement, governance, etc.	0	0.00	Others (airborne services, ICT in DRR, etc.)	230	2.19
Total		654	6.22		1518	14.43

* The costs for covering damages items were already approved to be allocated by the government.

Table 9: Damage and Loss in DRR Sector in Khuzestan

Sub-sector	Damage			Loss		
	Governmental and Public	Total Effects		Governmental and Public	Total Effects	
		IRR (Billion)	USD (Million)		IRR (Billion)	USD (Million)
DRR buildings	Offices, DRR buildings*	450	4.28	Temporary usage of other buildings	11	0.10
DRR equipment &infrastructure	IMO equipment, emergency electricity and facilities, etc.	42	0.40	Temporary usage of equipment or repairing costs	4	0.04
Relief items	Storages	0	0.00	Distributed relief items	720	6.85
Vehicles and heavy machineries	Cars and trucks, etc. *	290	2.76	Renting and repairing	660	6.27
Personnel	Casualties	0	0.00	Direct and indirect Payments	150	1.43
Services	Arrangement, governance, etc.	0	0.00	Others (airborne services, ICT in DRR, etc.)	327	3.11
Total		782	7.43		1872	17.80

* The costs for covering damages were already approved to be allocated by the government.

10.4 Recovery Strategy & Needs

Considering Build Back Better (BBB) strategies, the following measures are recommended to be implemented in the affected areas by 2019 floods in early recovery and capacity building for DRR.

10.4.1 Forecasting and early warning

Lack of adequate precision in weather forecasting and early warning was a main challenge in 2019 floods. This occurred mainly due to shortage of necessary equipment (such as rain gauges, river flow-meters, etc.) and lack of their integration to the early warning system. Therefore, replacement, development, improvement and sustainability of timely and understandable forecast and early warning systems (EWS) and strengthening the capabilities for observing, detecting, forecasting and warnings of weather-, water- and climate-related hazards as well as establishment of specialized hydro-meteorological monitoring stations can be considered as an early recovery priority in this sub-sector. Those stations should be managed by IMO and MOE and data should be shared with NDMO as well as the provincial and local governments to inform DRR decisions, processes and operations.

Promoting public participation in information dissemination and providing early warning can be considered as another priority in this sub-sector. In many cases, local residents by using mobile phones, SMS, whatsApp, amateur radio, etc. disseminated critical information and warnings to their communities and saved their lives. Therefore, capacity building in those aspects should be considered by local authorities.

Another issue in this sub-sector was lack of appropriate tools to provide necessary information for decision makers to evaluate the needs for emergency response, timely. However, after a couple of the days, it was shown that satellite images provided valuable information about the extent of the damaged areas by floods and this was used to calibrate data on damage and loss reported at different sectors. Therefore, developing decision support tools and models (such as quick loss and damage assessment systems) and promoting the collection, analysis, and use of relevant data and practical information in line with national circumstances and making use of space and in situ information that results from maintained and strengthened in situ and remote sensing data, earth and climate observations is another recovery program in this sub-sector of DRR.

10.4.2 Risk assessment and mitigation

Systematic assesment of risks can form the basis of resilient recovery as well as risk-informed development in the flood-affected areas. Preparing multi-hazard maps by relevant scientific research centers with support of

NDMO and PBO with appropriate scale (i.e. 1:50000) can be considered as a priority in this sub-sector. Such maps illustrate the natural hazard prone zones and can be considered a basis for recovery and development. In addition developing necessary inventories (including baseline datasets, historical databases, etc.) and establishment of National Disaster Observatory to conduct and manage risk assessment studies and to formulate national-local information exchange mechanism is essential.

In the absence of risk assessment studies, relevant authorities in Lorestan and Golestan are conducting studies to assess potential risks in the affected areas to inform the preparation of reconstruction plansand decisions on relocation of at-risk settlements. However, such studies should be done in advance to expedite reconstruction in the aftermath of disasters.

Preparing necessary guidelines and codes for construction of building and infrastructure exposed to multi hazards is another priority in mitigation planning. Those guidelines should be prepared by MRUD in assistance with relevant research institutions based on local socio-economic conditions.

Strict implementation of regulations for preventing reconstruction on river bed should be considered as a priority in early recovery planning. Based on existing guidelines, the prohibited zone for construction on riversides is determined based on floods with a 25-year return period. However, the 2019 flood submerged much wider areas (some experts believe it was a 100-year flood event). In addition, many informal settlements and houses were constructed inside the prohibited zones; most of them destroyed by floods. Therefore, the safe buffers around existing rivers should be re-calculated based on hydro-meteorological studies as well as socio-economic studies. In addition, necessary measures to control and prevent illegal construction on the riversides should be enacted.

Implementing protective and flood control measures (such as dredging, construction of protective walls, etc.) need to be done in all rivers based on risk assessment. One example was provided for Gorgan-Roud river earlier. Based on the reports of local stakeholders, this problem was one of the roots of flash floods in Lorestan and Golestan. Those measures will reduce the risk of flood to a large extent.

Adopting flood resilient construction techniques (such as installation of automatic flood resistant doors, using materials which will allow fast recovery, concrete block partitions, lime plaster or magnesium oxide boards, etc.) is also another solution to mitigate the flood risk. However, this needs modern and expensive technology that is not compatible with local capacities in most places.

Relocating people living in flood zones by incentive and punitive measures is another priority in DRR. However, this needs spatial plans, budget and legislation that should be formulated by NDMO, Iran Parliament, line ministries and local and provincial governments.

Watershed management and construction of local infrastructure (such as small storage dams) to control the flow rate of rivers and to feed aquifers is another important priority in preventing the floods.

Improving the management of water resources especially completing the indicated dams in the background sections and controlling the water flow in the existing dams may have also significant roles in flood management. The relevant authorities (specifically MOE and NDMO) should be in direct connection with the integrated forecasting and early warning systems to control the flow rates of dams before the new waves of heavy precipitation arrive. However, due to the value of water in arid and semi-arid regions in Iran, decision on emptying dams before potential floods is a risky and sensitive measure and may cause political and socio-economic challenges.

Developing appropriate insurance systems based on socio-economic and cultural conditions is another important priority. For this purpose, the government should develop necessary policies and providing applicable supporting systems to promote insurance penetration rate at local levels. However, considering the variety of socio-economic conditions at different parts of the country, this mechanism should provide necessary solutions for each community. For example, in Gomishan and Aq Qala that the majority of people are Sunni, normal insurance system cannot be applied and necessary cooperative solution or Islamic insurance (called as Takaful in Sunni countries like Saudi Arabia, Indonesia, Malaysia, etc.) can be promoted.

Flood modeling based on different scenarios may also help decision makers to allocate necessary resources to undertake mitigation measures in critical sites and aimed at most vulnerable populations, before the occurrence of flood. Such measures are not much expensive (when compared with physical interventions) and can be done in short term by relevant research centers. In this line, the effects of implementing preventive measures to reduce the risk of flood can be also modeled and assessed. This should be done based on the request of the local to national governments and the results should be reflected in developments plans to ensure that the results of flood modeling are used by decision makers for planning and budgeting.

10.4.3 Preparedness

Promoting public awareness and knowledge to increase preparedness for floods by different means (media, schools, social networks, etc.) is the first priority that can be done by limited resources. Organizing regular DRM drills and simulation exercises for the public and all key entities responsible for disaster response will promote preparedness of different segments of the society to potential disasters.

Developing emergency response plans and determining safe and appropriate routes and places for evacuation in the areas prone to flood is a necessity that should be addressed by NDMO. For instance, in Khuzestan (Shadegan) and Golestan (Aq Qala and Gomishan) that have flat topography, many people were forced to go to the roof of their houses for saving themselves. Therefore, they exposed themselves to the risk of collapse of buildings by the flood.

Lack of systematic cooperation between people affected by the flood also was a challenge in the affected provinces by the floods. In addition, due to existing different minorities in the affected provinces (such as refugees from Afghanistan in Golestan), establishment of participatory activities between different groups is a need. Establishment of CBDRM groups to carry out necessary activities for risk reduction at community level before disaster and provide assistance in emergency response and early recovery may address this issue to some extent. This can be done in the context of “Safe Schools – Resilient Communities” that is a national program to be implemented in whole the countries by 2025. In this program, safe schools will be assigned as local hubs at neighborhood levels to make a continuous network with local communities to promote their participation in DRR and DRM activities.

Using knowledge, innovation and education to build a culture of safety and resilience is a priority that has been addressed in Sendai Framework for DRR as well. In this context, promoting and improving dialogue and cooperation among scientific and technological communities, the private sector, other relevant stakeholders and policymakers will facilitate a science/policy interface for effective decision-making in disaster risk management.

Allocating sufficient resources (staffing, equipment, logistical capacity, etc.) to the governmental and public institutions, responsible for disaster management and preparedness (especially NDMO and RCS and their provincial offices) is an underlying factor that prevents effective implementation of DRR. Although based on existing laws considerable amounts of budgets should be allocated for DRR measures, but in reality, a small part of that amount normally considered for mitigation and preparedness and most of them are used for response measures.

10.4.4 Emergency response

It was shown that lack of emergency response action plans caused difficulties in providing necessary response services in the flood affected provinces. To enhance the effectiveness of emergency response, it is proposed that Initial Action Plans (IAP) and Standard Operating Procedures (SOP) that clearly articulate the roles and responsibilities of each institution as well as individuals who provide necessary services and the steps to be followed before, during and after the disaster, are prepared.

Capacity building of NDMO staff at the national, provincial and local offices as well as key personnel from the relevant governmental institutions involved in emergency response (such as MOHME), military forces, IRCS, NGOs, civil society, international organizations, private sector and communities is another priority in this sub-sector that may improve the response capacities.

In order to facilitate timely and effective response, appropriate plans for search and rescue, relief distribution, evacuation, provision of emergency shelter, ICT, etc. need to be considered as a priority.

It was shown that access to necessary machineries, tools and equipment (such as heavy machineries, temporary bridges, etc.) was also a critical challenge after 2019 floods. Therefore, necessary plans/procedures for procurement of those machineries as well as emergency supplies (such as power generators, tents, blankets, water and food) should be prepared in advance and implemented. In this line, necessary contracts with relevant private companies (contractors) or individuals (such as owners of heavy vehicles) to provide necessary services at the time of crisis can be prepared and signed.

10.4.5 Recovery and reconstruction

No policy or plan was available, either at the national or provincial level to guide the recovery and reconstruction process after a disaster that could be used in the areas affected by the 2019 floods. Therefore, it is recommended that a national policy on recovery as well as guidance for development and implementation of national, provincial and local recovery plans be developed. In this planning, the impacts of climate change, adaptation as well as socio-economic aspects of recovery should be also addressed. In addition, the affected population should be involved in the process of recovery planning to improve the ownership. All planning and activities for recovery and reconstruction should be in line with BBB strategies based on studies and modeling of potential risks.

Recovery Needs

In this part the necessary budget for addressing the recovery needs, based on what explained earlier is presented. It should be noted that the recommended recovery needs in DRR sector are applicable for all three flood-affected provinces; while the allocation of the budget should be based on the damage and loss in each province. In addition, since the total values for repairing/ reconstructing DRR buildings and replacing emergency vehicles such as cars, trucks, etc. has already been allocated by the Government in advance based on the current budget for disaster management, therefore not included in the Recovery Needs.

Table 10: Short-term Recovery Needs

Sub-sector	Program of Activity	Value		Responsible Agency
		IRR (Billion)	USD (Million)	
Forecasting and early warning	- Replacement of damaged equipment in weather stations, development and improvement forecast and early warning systems (EWS) - Making use of weather satellite for damage assessment and weather forecasting - Strengthened remote sensing data	230	2.19	PBO, NDMO, IMO, Iranian Space Agency (ISA), National Cartography Center (NCC)
Risk assessment and mitigation	- Developing necessary inventories (including baseline datasets, historical databases, etc.) - Re-calculating safe buffers around existing rivers - Evaluating and modeling the risk of flood - Improving the management of water resources	340	3.23	PBO, NDMO, Line ministries and their local to provincial offices, IMO, Municipalities
Preparedness	- Promoting public awareness and knowledge - Using knowledge, innovation and education to build a culture of safety against floods in the disaster prone areas.	120	1.14	NDMO, IRCS and Line ministries (from national to local levels), IRIB, Municipalities
Emergency response	- Preparing Initial Action Plans (IAP) and Standard Operating Procedures (SOP) - Formulating appropriate emergency response plans - Supplying emergency materials	430	4.09	NDMO, IRCS, Relevant taskforce organizations and research centers and their provincial and local offices
Recovery and reconstruction	- Recovery planning based on existing risks at national, provincial and local levels.	15	0.14	NDMO, Universities, Research centers, Governor offices, Municipalities
Total		1135	10.79	

Table 11: Medium-term Recovery Needs

Sub-sector	Program of Activity	Value		Responsible Agency
		IRR (Billion)	USD (Million)	
Forecasting and early warning	- Developing decision support tools and models - Promoting public participation in information dissemination and providing early warning	120	1.14	IRCS, NDMO, Research centers, IRIB, Line ministries, IMO
Risk assessment and mitigation	- Preparing multi-hazard maps - Preparing necessary guidelines and codes - Implementing protective and flood control measures - Watershed management and construction of local infrastructure	1400	13.31	NDMO, Line ministries and PBO (from national to local levels), Universities, Research centers, Municipalities,
Preparedness	- Promoting public awareness and knowledge - Developing applicable plans and determining appropriate places for evacuation - Establishment of CBDRM groups - Promoting and improving dialogue and cooperation among scientific and stakeholders at local levels to make DRR measures specifically at the flood prone regions - Allocating sufficient resources (staffing, equipment, logistical capacity, etc.) for DRR	750	7.13	IRCS, NDMO, IRIB, Relevant ministries, Military forces, PBO, Governor-offices, Municipalities
Emergency response	- Capacity building at NDMO and its provincial and local offices as well as other entities involved in emergency response	85	0.81	PBO, NDMO, IRCS (from national to local levels)
Recovery and reconstruction	- Preparing recovery plans based on climate change, adaptation as well as socio-economic aspects at different levels	130	1.24	Relevant ministries, Research centers, Governor-offices, Municipalities
Total		2485	23.63	

Table 12: Long-term Recovery Needs

Sub-sector	Program of Activity	Value		Responsible Agency
		IRR (Billion)	USD (Million)	
Forecasting and early warning	- Establishment of specialized hydro-meteorological and monitoring stations	150	1.43	NDMO, Line ministries, IMO, PBO
Risk assessment and mitigation	- Establishment of National Disaster Observatory - Developing and adopting flood-resilient construction standards in areas prone to floods - Relocating people living in flood zones	1600	15.21	NDMO, PBO, Research centers, Line ministries, Governor office, Municipalities
Preparedness	- Initiating the appropriate insurance system	650	6.18	Ministry of Economic Affairs and Finance (MEAF), Central Insurance of Iran (CBI), PBO
Emergency response	- Procurement of the necessary machineries, tools and equipment (national to local level)	1500	14.26	Municipalities, NDMO, IRCS, MEAF, MRUD, PBO, Municipalities, Governor office.
Recovery and reconstruction	- Recovery and reconstruction planning in the flood-affected areas based on BBB strategies	230	2.19	PBO, Municipalities, NDMO, MEAF, MRUD
Total		4130	39.26	

Table 13: Summary of Short-, Medium- and Long-term Recovery Needs

Sub-sector	Short-term		Medium-term		Long-term		Total	
	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Forecasting and early warning	230	2.19	120	1.14	150	1.43	500	4.75
Risk assessment and mitigation	340	3.23	1400	13.31	1600	15.21	3340	31.75
Preparedness	120	1.14	750	7.13	650	6.18	1520	14.45
Emergency response	430	4.09	85	0.81	1500	14.26	2015	19.16
Recovery and reconstruction	15	0.14	130	1.24	230	2.19	375	3.57
Total	1135	10.79	2485	23.63	4130	39.26	7750	73.68

Table 14 presents the share of each province from the total budget proposed in this study. The proportions have been estimated based on total damage and loss that indirectly may reflect the required needs for each province.

Table 14: Summary of Short-, Medium- and Long-term Recovery Needs at each Province

Province	Short-term		Medium-term		Long-term		Total	
	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Lorestan	499.4	4.75	1093.4	10.40	1817.2	17.28	3410	32.42
Golestan	283.75	2.70	621.25	5.91	1032.5	9.82	1937.5	18.42
Khuzestan	351.85	3.35	770.35	7.32	1280.3	12.17	2402.5	22.84
Total	1135	10.79	2485	23.63	4130	39.26	7750	73.68

10.5 Assessment Methodology

This Chapter was prepared by the International Institute of Seismology and Earthquake Engineering (IIEES) in collaboration with NDMO, PBO and some of the relevant institutions in Golestan, Lorestan and Khuzestan provinces. The study team organized meetings with stakeholders to clarify the data needed for PDNA report. For this purpose, at first the required fields of data that should be gathered by relevant institutions have been listed and reflected into an Excel file. Then, this file has been shared with relevant institutions to be filled and returned to. This includes the baseline information about each sub-sector as well as the effects and impacts of the flood on them. However, it was observed many critical data have not been collected appropriately after the flood and could not be quantified. Moreover, some data has not been shared due to security considerations. Therefore, in order to formulate the report, published data from different sources was used. In addition, data was gathered during the workshop organized by PBO, in which participants from different provinces provided some data orally.

Finally, based on available information and best practices worldwide, some recommendations for recovery and reconstruction have been proposed to be implemented in the short, medium and long term by relevant institutions.

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11. Environment

11.1 Summary

The 2019 widespread flooding in Iran affected, among others, the provinces of Golestan, Khuzestan, and Lorestan which are the focus of this assessment. Due to the floods, about 618,000 ha of forest and rangeland (GAME guard station) in Lorestan province have been severely damaged. Landslides damaged 70 natural and artificial water springs, 250 km of roads in protected areas, damages to environmental buildings (i.e offices) and infrastructures (especially 11 bridges inside the indicated areas), damages to 3 air pollution stations in Delphan, Kouhdasht and Pole-Dekhtar, and the waste disposal site in Pol-e Dokhtar. In Golestan province, about 500 ha of land at the Golestan National Park were damaged including 100 km of forest roads, 5,000 meters of protective fences, the complete destruction of two conservation units and wildlife water pools. About 25 springs were destroyed in other protected areas of the province.

In some cities of the province of Khuzestan, parts of the municipal landfill were completely submerged and the dumping of rural waste around the Dez national park and Dez protected area caused the waste to be transferred to the Dez forest and river which caused pollution in these areas. In addition, due to damages to petroleum-based mulch facilities, a big oil spill occurred in Karun River, close to Salmaneh village. Fortunately, this problem was addressed immediately by the National Iranian Oil Company and other relevant authorities. Damages to oil rigs and bentonite supply facilities also caused pollution after the floods.

In addition, small dams and waterbreaks of watershed management system were totally destroyed and consequently large amount of soil was washed away. Pollution from large quantities of disaster debris is also a challenge. On top of all the debris produced from the collapsed buildings, the mud and silt deposited during the floods became an added problem to deal with, especially in urban areas where it simply could not be cleaned out and dumped in the front yard (such as Aq Qala and Gomishan in Golestan and Pole-Dokhtar and Mamulan in Lorestan). The floods have really exacerbated the challenges of solid wastes management in these three affected provinces.

Overall, most of the damage to the environment were on rivers, forests, wetlands and wildlife species, among others. The following table shows the environmental damages, which are public in nature, in the 3 provinces. The costing of the damages was based on the valuation of environmental experts, as explained in the methodology section.

Table 1. Damages to the environment to the 3 provinces

Province	Total Damages	
	IRR (Billion)	USD (Million)
Lorestan	1499.1	14.252
Khuzestan	134.5	1.279
Golestan	59.9	0.57
Total	**1693.5**	**16.101**

Observed losses to the environment were not quantified at this point, which include the reduction of expected benefits from the ecosystem and biodiversity. Due to the floods, the upper organic layer of soil which was porous and rich in humus nutrients were washed away, thus, reducing the potential for absorbing runoff water as well as decreasing the rate of regeneration of native forest and rangeland. Several trees and other plant species were uprooted destroying much of wildlife food sources and the habitat of many several species such as the squirrel. Moreover, the large deposit mud into wetlands (such as Dalan, Shoor and Doroud) has reduced the effectiveness of these wetlands in preventing future floods. The excess water in some areas has led to the unusual growth of grass and some other plants, which increased the probability of fire, especially during the dry, hot seasons.

To recover from the effects of the floods, a total of IRR 1489 billion (USD 14.156 million) is the estimated needed amount to cover bio-diversity, waste management and debris removal.

11.2 Sector Background

According to the data obtained from the Department of Natural Resources and Environment of Lorestan province, the total area of natural resources of this province is 2,101,671 ha, of which 884,357 ha is rangelands and 1,217,314 ha is forests. Amongst the provinces' total natural resources; about 451,000 ha is under management and no-hunting territories, home to sensitive habitats. The forests of the province extend as a strip along the Zagros Mountains started from the southwest to the center of the province and then enlarged towards the northwest. The most important species and index of forests in Lorestan province is Iranian oak species, which covers more than 60% of the forests in Lorestan province. Other forest species include Dharmazo, Kikm, Corm, Gulkhonak, Arjan, Camel, Tangress, Wild cherry, Wild pear, Hawthorn, etc. which can be found in association with oak species or as distinct types of forest in the province. The main natural reserves in Lorestan, include: National Natural Cave of Blind Fish zone with 4 ha area, Sefidkuh wildlife refuge (25683 ha), Lorestan's salamander wildlife refuge (891 ha), Oshtorankouh protected area (81010 ha), Sefidkuh protected area (70031 ha), Pole-Dokhtar prohibited hunting and fishing wetlands zone (18144 ha), Qalikuh Aligodarz prohibited hunting and fishing zone (113654 ha), Garrin Ashtar prohibited hunting and fishing zone (59750 ha), Chaharshakh Noorabad prohibited hunting and fishing zone (13900 ha), Hashtad Pahloo prohobited hunting and fishing zone (18500 ha), the second habitat of Lorestan's salamander (Shadabkouh) with 24313 ha area, Dalani Borujerd wetland (1560 ha) and Tanourdar wetland in Doroud (3689 ha). In these places, about 358 animal species and 1750 plant species have been identified.

Khuzestan province is located in the warm and arid region of the country with a direct 200 km water border with the Persian Gulf. Most of Khuzestan plain cities are surrounded by deserts and dunes. Some of these cities are sometimes affected by the dust air pollution phenomenon, due to the wind direction and pattern as well as the widespread desert in neighboring countries. For this reason, there are currently 21 air quality monitoring stations across the province. In addition, there are five active air pollution stations owned by industrial units. On the other hand, during recent years, the continuing drought caused abnormal exploitation of underground water for irrigation purposes that caused serious impacts on water table. The Shadegan International Wetland and Wildlife Refuge with an area of approximately 530,000 ha is one of the most important wildlife habitats, not only in Khuzestan but also in Iran. This place is a very suitable habitat for endangered native and migratory birds such as marble ducks, gray-footed pelicans, large herons, yellow herons, Indian herons, small butlers, black-headed ducks, oak ducks, and eagles. Animal species in Khuzestan province include 58 mammal species, 285 bird species, 75 reptile species, 4 amphibian species and 57 fish species. In addition, 950 plant spices have been discovered in this province. There are about 695,427 ha of lands designated as conservation areas, 32,870 ha of prohibited hunting areas, and 425,440 ha of wetlands which are all under the management and protection of the Department of Environment. The most important national natural site of Khuzestan is Shoy waterfall with about 50 ha area while the Dez National Park with 6127 ha, and Karkheh National Park with 6116 ha, are the most important National Parks.

Khuzestan province produces about 3600 tons of municipal waste daily, about 1000 tons of which is devoted to Ahvaz. 35% of cities in the province do not have environmental permits for municipal waste disposal, and among the cities which have permits, about 10% of them dump their waste in unauthorized places despite the existence of authorized sites.

In Golestan province, due to the favorable weather conditions and soil fertility, vegetation is very diverse and about six natural parks exist. There are different kinds of forest trees, shrubs and plant species as well as herbal medicinal plants all over the province. The Golestan National Park (Golestan Forest) is a protected territory in the east of the province. This region is the oldest national park in Iran with almost 1,350 plant species and home to about 358 wildlife species including half of Iran's mammalian species (such as leopard, brown bear, wolf, lynx, ibex). This region was registered as one of the 50 biosphere reserves of the planet in the UNESCO World Heritage List while three international wetlands (Alagol, Almagol and Ajigol) with an area of 1400 hectares, have been formally recognized in this province since 1975

based on the Ramsar Convention, and are protected by the Department of Environment. In addition, Gomishan wetland, one of the most important wetlands of Golestan, was registered as an international semi-saline wetland in 2001 in accordance with the Ramsar Convention.

11.3 Assessment of Disaster Effects

In Tables 1, 2, 3 and 4 a brief description of the damages to environmental subsectors in the three provinces of Lorestan, Khuzestan and Golestan is presented. The indicated data will be discussed in the following sections.

Damage

Based on existing reports and the information and data gathered from the relevant executive agency, some of the important factors in increasing flood damage in the three affected provinces are: a) inadequate watershed operations; b) widespread land use change to agriculture (mainly dryland) and consequently elimination of natural vegetation in the area; c) scarcity of rangelands; d) overgrazing; and e) construction inside the river bed.

Flood in Lorestan displaced 299 million cubic meters of earth due to landslides in 207,000 ha of the province's lands, causing damages to 70 natural and artificial water springs, 250 km of roads in protected areas, damages to environmental buildings (i.e offices) and infrastructures (especially 11 bridges inside the indicated areas), damages to 3 air pollution stations in Delphan, Kouhdasht and Pole-Dekhtar, and the waste disposal site in Pol-e Dokhtar.

In Khuzestan province, the wetlands of Hur-al-Azim, Shadegan and Bamdjeh were spared by the floods and the only damage was related to the survey buildings. In some cities of the province, parts of the municipal landfill were completely submerged and the rest were flooded partially, despite the construction of a levees. The dumping of rural waste around the Dez national park and Dez protected area caused the waste to be transferred to the Dez forest and river which caused pollution in these areas. In addition, due to damages to petroleum-based mulch facilities, a big oil spill occurred in Karun River, close to Salmaneh village. Fortunately, this problem was addressed immediately by the National Iranian Oil Company and other relevant authorities. Damages to oil rigs and bentonite supply facilities also caused pollution after the floods.

In Golestan province, about 500 ha of land at the Golestan National Park were damaged. These include the destruction and drift of 100 km of forest roads, 5,000 meters of protective fences, the complete destruction of two conservation units, and the destruction of wildlife water pools with a volume of 320 cubic meters. In addition, 160 cubic meters of wildlife water pools and 25 springs were destroyed in other protected areas of the province.

The following table shows the value of damages to the environment in the 3 provinces which are all pubic in nature.

Table 2: Damage in the environment in the provinces of Lorestan, Khuzestan and Golestan

Sub-sector	Damage by Province				
	Lorestan IRR (B)	Khuzestan IRR (B)	Golestan IRR (B)	Total Damage	
				IRR (Billion)	USD (Million)
Forests	101.9	60.5	NA	162.4	1.544
Rangelands	15.3	NA	1	16.3	0.155
Plains	NA	14.4	NA	14.4	0.137
Hills	2.5	NA	NA	2.5	0.024
Plant species	5.8	12.5	4	22.3	0.212
Wildlife species	34.5	12	20	66.5	0.632
Stagnant water	10	NA	10	20	0.190
Wetlands	66	33.5	NA	99.5	0.946
Lakes	1	NA	NA	1	0.010
Rivers	903.5	NA	NA	903.5	8.590
Watershed	3.9	NA	NA	3.9	0.037
Air monitoring stations	5	NA	NA	5	0.048
Natural park	3.5	1.6	24.9	30	0.285
Waterfall	3	NA	NA	3	0.029
Debris	343	NA	NA	343	3.261
Solid waste	0.2	NA	NA	0.2	0.002
Total	**1499.1**	**134.5**	**59.9**	**1693.5**	**16.101**

Loss

There are losses to the environment which cannot be valued at this point, which include the potential reduction of benefits from the ecosystem and biodiversity due to the effects of the floods and landslides. Due to the floods, the upper organic layer of soil which was porous and rich in humus nutrients were washed away. Therefore, the potential for absorbing runoff water was reduced and the rate of regeneration of native forest and rangeland species will decrease. In addition, due to damages of the watershed and intensity of flood, the rate of flow accelerated in natural waterways which uprooted several trees and other plant species. The destruction of these trees has destroyed much wildlife food sources and destroyed the habitat of many several species such as the squirrel. Moreover, the influx of large mud into wetlands (such as Dalan, Shoor and Doroud) has reduced the effectiveness of these wetlands in preventing future floods.

The excess water in some areas has led to the unusual growth of grass and some other plants, which increased the probability of fire, especially in hot seasons. Furthermore, the accumulation of stagnant water in rural areas (such as Chaleh village) and the leakage of sewage created a large quantity of contaminated water that required excess cleaning up cost. The contaminated drinking water can cause additional cost in health care both for humans and the wildlife if not immediately addressed. Furthermore, the high volume of waste generated by the evacuees and the relief activity also created an additional challenge for waste disposal management.

Social impacts of damage and loss

Considering the interdisciplinary nature of the environment, the damages caused by the 2019 floods will have many indirect social consequences for the local residents of the three affected provinces. For example, in the livelihood sector, the potential loss of water and soil-related jobs will lead to a reduction in the income of the local people. The destruction of forests and grasslands can result in the possibility of multiple damage to the natural resource ecosystem such as damage to migratory wild bird habitats and the scarcity of fertile soil. In addition, in the energy sector, due to reduction of income of households and difficulties to access energy resources (such as oil, gas and electricity), local residents will tend to cut trees as a supply of heating and cooking needs which can result not just to deforestation but also environmental pollution. Moreover, due to the abovementioned impacts, environmental damages and losses can result to the following possible consequences:

- The probability of extinction of valuable species of native plants and animals (such as Persian yellow deer);
- The spread of pollution threatening the health of local peoples as well as wildlife caused by stagnant waters (the abnormal rise in the number of crickets and the influx of insects into Khuzestan provinces can be related to this issue);
- The significant increase in the volume of deposits in the rivers due to soil erosion (especially in Karun, Dez and Karkheh rivers) that may lead to sedimentation in wetlands.
- If natural parks will not be restored immediately, people will lose their recreational places.

11.4 Recovery strategy & needs

In order to fully integrate environmental needs, the objective and priorities for early recovery have been developed, based on timely and well-ground assessment of identified needs. Moreover, reconstruction and rehabilitation works have been proposed to address all environmental challenges and finally a resilient recovery plan for building back better (BBB) will be addressed and discussed to be implemented within three different time frames: (i) in short-term, (ii) in mid-term, and (iii) in long-term.

The extent of the devastation caused by the 2019 flood, depicted how underlying environmental factors contribute to disaster-related damages and losses. Therefore, those floods can be considered as a significant opportunity to develop recovery strategies to prevent further damages to environment as well. In order to build back better in environment sector, different measures should be addressed. For the first step, dredging rivers and coastal areas can be considered as a priority to protect the environment and prevent the risk of flood in the future.

This may also create temporary jobs and provide immediate source of income for local residents, through cleaning up the riverbanks and river trails and recycling the wasted material. Encouraging people to be involved in protection of the environment and change their attitude toward natural environment as a living resource should also be given importance. Another issue that should be considered for addressing BBB is to develop green energy resources (like using solar and wind energy) for the local residents to improve the state of the environment. However, this will need feasibility studies on the potential impacts of solar and wind energies facilities to the environment.

In the area of disaster risk reduction, many measures should be considered to reduce the risk of potential floods in the future (such as developing forests, using protective structures inside the unstable parts, etc.). For this purpose, environmental risk assessment studies should be undertaken to evaluate the risk of floods with different return periods in order to make necessary plans for short-term, mid-term and long-term interventions.

Increasing the preparedness of the people is another important policy to be addressed in early recovery. Improving the interaction of local residents with the government and necessary trainings about the importance of protecting environment to prevent natural hazards can also be organized. Local capacities can be enhanced to promote livelihood for those residents living in or around the forests. For example, ecotourism can be promoted in these areas and which can help people economically while protecting the environment.

In emergency response planning, necessary action plans should be formulated to indicate the roles and responsibilities of different groups to confront with the impacts of floods on the environment. Protection of damaged plants and wild life after disasters, prevention of secondary hazards (such as fire due to irregular growth of grass after floods) and organizing community based groups for disaster management at environmental sub-sectors are some key measures that can be proposed in this area. Finally, the BBB strategies should be mainstreamed in recovery and reconstruction in this sector.

Besides of the above mentioned strategies, there are some other activities to be addressed in recovery planning in short- to long-term planning as follows:

- Daily monitoring of rivers to avoid probable water resources pollution crisis;
- Removal of drainage in wetlands and their restoration due to existing natural conditions;
- Preventing the early grazing of nomadic livestock in under control areas (this may cause irreversible damages to these areas, as they have been damaged by the floods earlier);
- Removing gardens from the arteries of the wetlands;
- Delineation of hydrological and ecological buffers in the wetlands;
- Implementing ecotourism projects and replacing environment-friendly jobs with professions having a destructive nature.

The following tables describe the needs of the environment sector.

Table 3: Short Term Recovery Needs (1 year)

Sub-sector	Program of Activity	Value		Responsible Agency
		IRR (Billon)	USD (Million)	
Biodiversity	- Daily monitoring of rivers to avoid probable water resources pollution crisis	6	0.057	Department of Environment (DOE); Forests, Rangelands & Watershed Management Org. (FRWMO), Iran Veterinary Org. (IVO), PBO, Ministry of Agriculture Jahad (MOAJ)
	- Vaccination of all livestock and poultry to prevent common diseases with wildlife	8	0.076	
	- Providing respiratory mask for those at risk of dust that can be released from dried mud	3	0.029	
	- Prevention and control of fire risk in susceptible areas, especially in dry seasons	5	0.048	
	- Stabilization the roots of trees exposed after the floods	4	0.038	
	- Providing water and food resources for wildlife and treatment of injured ones	6	0.057	
	- Urgent action to control leakage of pollutants into habitats and sensitive areas	3	0.029	
	- Reconstruction of damaged buildings and infrastructures related to environment sector based on standards	4	0.038	
	- Preventing the early grazing of nomadic livestock	8	0.076	
Debris removal	- Clearing wildlife habitats from any contamination or animals' corpse	4	0.038	Housing Foundation , DOE, Governors
	- Debris removal from wildlife habitats	6	0.057	
Solid waste	- Reconstruction of damaged solid waste transportation machinery and creating new facilities for recycling	30	0.286	Municipalities, Governors, DOE, PBO
	- Site selection for solid waste disposal to ensure environmental safety issues	35	0.333	
Total		122	1.16	

Table 4: Medium Term Recovery Needs (2 years)

Sub-sector	Program of Activity	Value		Responsible Agency
		IRR (Billion)	USD (Million)	
Biodiversity	- Public education for environment protection and developing participative approaches for climate change and disaster resilience at local level (for managers, women, children, farmers, ranchers, etc.)	8	0.76	DOE, FRWMO, Water companies, Ministry of Energy (MOE), PBO, MEDU
	- Determination and protection of river buffers inside environmental sub sectors	15	0.143	
	- Continues monitoring of rivers to prevent pollution	12	0.114	
	- Medicinal plants cultivation in rangelands (for soil conservation and creating a job opportunity for local people)	10	0.095	
	- Cultivating low hydrophilic crops (such as saffron) considering compatibility with local climate	10	0.095	
	- Preventing of Venkocarpus trees plantation in Pol-e Dokhtar region	2	0.019	
	- Creation of green belt around affected settlements to preventing dust storms due to deposited mud and clays	20	0.19	
	- Abolishing all instructions and permits related to construction on river banks	10	0.095	
	- Restoration of damaged environment centers roads and buildings based on BBB policies	20	0.19	
Debris removal	- Dredging the rivers inside the protected and unprotected national lands	70	0.667	Housing Foundation , Governors, MOE, DOE
	- Developing necessary facilities for recycling debris and construction materials	30	0.286	
Solid waste	- Organizing trainings on solid waste separation for students, women, businesses and marketers	5	0.047	Municipalities, IRIB, Governors, DOE
	- Promoting solid waste management knowledge (for managers, local authorities, etc.)	10	0.095	
	- Creating comprehensive solid waste management systems	5	0.047	
Total		**227**	**2.159**	

Table 5: Long Term Recovery Needs (2-5 years)

Sub-sector	Program of Activity	Value		Responsible Agency
		IRR (Billion)	USD (Million)	
Biodiversity	- Rebuilding damaged watersheds and aquifers in environmental subsectors	300	2.857	FRWMO, DOE, PBO, MOE, MOAJ
	- Improving damaged rangelands cover	200	1.9	
	- Developing ecotourism	100	0.95	
	- Enacting regulations and guidelines to prevent construction and cultivation in or around river banks	100	0.95	
	- Installation and commissioning online river bank monitoring	50	0.47	
	- Improving coordination amongst the environmental, natural resource and disaster management institutions	10	0.095	
Solid waste	- Restoration of the existing landfills to the forest park	10	0.095	Municipalities, Governors, DOE, Research centers
	- Establishment of optimal solid waste management system covering all aspects of collection, recycling and disposal process, and utilizing up to date technology in waste recycling and composting	370	3.815	
Total		**1140**	**10.835**	

In summary, the total needs for the environment sector is shown in the following table:

Table 6. Summary of needs

Sub-sector		Needs (in Billion IRR)			Total	
		Short-term	Medium-term	Long-term	IRR (Billion)	USD (Million)
Lorestan	Biodiversity	32	80	629	741	7.045
	Debris removal	10	100	NA	110	1.046
	Solid waste	65	20	380	465	4.421
	Total	107	200	1009	1316	12.512
Khuzestan	Biodiversity	9	18	90	117	1.112
	Debris removal	NA	NA	NA	NA	NA
	Solid waste	NA	NA	NA	NA	NA
	Total	9	18	90	117	1.112
Golestan	Biodiversity	6	9	41	56	0.532
	Debris removal	NA	NA	NA	NA	NA
	Solid waste	NA	NA	NA	NA	NA
	Total	6	9	41	56	0.532
Total		**122**	**227**	**1140**	**1489**	**14.156**

By province, the following table shows the damages and needs of the environment sector.

Table 7. Summary of damages and needs of the environment sector by province

Province	Damage	Loss	Total Effects		Needs				
	IRR (Billion)	IRR (Billion)	IRR (Billion)	USD (Million)	Short-term IRR (Billion)	Medium-term IRR (Billion)	Long-term IRR (Billion)	Total	
								IRR (Billion)	USD (Million)
Lorestan	1499.1	NA	1499.1	14.252	107	200	1009	1316	12.512
Khuzestan	134.5	NA	134.5	1.279	9	18	90	117	1.112
Golestan	59.9	NA	59.9	0.57	6	9	41	56	0.532
Total	**1693.5**	**NA**	**1693.5**	**16.101**	**122**	**227**	**1140**	**1489**	**14.156**

11.5 Assessment Methodology

In order to assess damage and loss of 2019 floods in environment sector, the required data to be collected by relevant institutions have been listed in the form of an excel file, using the standards guidelines provided by UNDP, The World Bank and The European Union. Then, this table was shared with relevant institutions to be filled out based on site survey and other available databases. The required data includes the baseline information about each subject as well as the effects and impacts of the flood on them. Having prepared the data structure, a two-day workshop was held by Plan and Budget Organization (PBO) in Tehran. In this meeting, many experts and authorities participated from the PBO, Department of Environment (DOE), as well as Forests, Rangelands & Watershed Management Organization (FRWMO).

In this report, damage assessment is determined based on expert opinion, mainly by representatives of the FRWMO and DOE as well as the Islamic Revolution Housing Foundation of Lorestan, Khuzestan and Tehran Provinces. In fact, local experts have visited the damaged area and they have estimated the cost of environmental damages based on available methods and their expert judgments. For instance, in order to estimate the cost of damage in forests, first, affected land area was measured. Then according to the volume and value of washed soil in the area, as well as the number and type of affected trees, total damages to the forest was calculated using the 2018 price list published by PBO. Similarly, based on the volume and value of washed soil in the area and the vegetation density at the affected rangelands, total damage to the rangelands was calculated using the same price list.

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12. Employment and Livelihoods

12.1 Summary

The pre-disaster statistics, based on the results of the 2016 survey of labor force, indicate that in Golestan, 26 per cent of employees work in manufacturing sector, 28.2 per cent in agriculture and about 45.9 per cent in services sector. In Lorestan, to have an image, 29.5 per cent of employees are in manufacturing, 23.8 per cent in agriculture sector and about 46.7 per cent in services sector, while in Khuzestan, 28.8 per cent of these employees work in industry, 20.1 per cent in agriculture sector and the rest are active in services sector. Due to the damages caused by the floods in the sector/sub-sectors of agriculture, industry and mining, tourism, carpet weaving, cooperatives, guilds, home-based jobs and other economic activities, which is estimated at IRR 14,296 billion (USD 135.9), sources of incomes and employment have been disrupted.

In Lorestan, more than 31,000 work

ers in agriculture, mining, tourism, carpet weaving, cooperatives and guilds sectors lost their jobs resulting in an estimated income loss of USD 32 million. In Golestan province, more than 17,000 workers lost their source of incomes in the same economic activities as those in Lorestan and income losses is estimated about USD 18 million. In Khuzestan province, around 8,700 people in agriculture, industry and mining as well as those home-based workers lost their livelihoods totaling to an estimated income losses of USD 9 million. Table 1 shows the pre- and post-floods unemployment in the 3 provinces.

Table 1. Pre- and post-disaster unemployment

Province	Number of Unemployed			
	Before the flood	Additional due to the flood	Total after the flood	% Increase
Golestan	35,879	17581	53460	50
Lorestan	70,967	31736	102703	88
Khuzestan	161,027	8702	169729	5
Total	267,873	58019	267873	21

In total, more than 58,000 workers have temporarily lost their livelihoods due to the floods which is about IRR 6226 billion (USD 59 million) in lost wages. Immediately after the floods, the numbers of unemployed people in the 3 provinces have increased from 268,000 to 326,000 persons or by 21%.

To regain lost employment, the Ministry of Labor, Welfare, and Social Co-operatives (MLWSC) has devised different 2 approaches within the short- and medium term. The first approach entails the implementation of supportive and incentive programs to support unemployed persons which include unemployment insurance payment, encouraging public employment in dredging, reconstruction and repair of public damaged buildings and infrastructure, and enterprise subsidy scheme to incentivizing enterprises to attract and employ unemployed population. The second approach is the reconstruction, restoration and rehabilitation of affected economic units through bank loans with minimal interest to reduce the cost of capital for business owners. The summary of needs to restore livelihoods is shown in Table 2.

Table 2. Summary of recovery needs in livelihood

Province	Short-term		Medium-term		Long-term *		Total	
	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Golestan	874	8.31	2352	23.33	NA*	NA*	3328	30.67
Lorestan	1552	14.76	2589	25.52	NA*	NA*	4236	39.37
Khuzestan	3923	37.30	9524	90.73	NA*	NA*	13466	127.84
Total	6349	60.36	14465	137.52	NA*	NA*	21030	197.88

12.2 Sector Background

Based on results of the 2016 survey of labor force in Golestan, 26 per cent of employees work in manufacturing sector, 28.2 per cent in agriculture sector and about 45.9 per cent in services sector. In Lorestan, to have an illustration, 29.5 per cent of employees are in industry, 23.8 per cent in agriculture sector and about 46.7 per cent in services sector, while in Khuzestan, 28.8 per cent of these employees work in industry, 20.1 per cent in agriculture sector and the rest are active in services sector. Additional information about total population, active population, employed population, unemployed population, unemployment rate and active enterprises are shown in Table 3.

Table 3. Labor and employment-related information

Indicators	Provinces			Total
	Golestan	Lorestan	Khuzestan	
Number of cities	6	10	7	23
Number of active enterprises	15,326	18,299	66,739	100,364
Total population	603,504	1,421,265	2,715,111	4,739,880
Active Population	242,777	537,634	1,107,655	1,888,066
Employed Population	206,898	466,667	946,628	1,620,193
Number of employees covered by compulsory insurance	65,595	159,849	558,139	783,583
Unemployed Population	35,879	70,967	161,027	267,873
Unemployment Rate (%)	14.8	13.2	14.5	N.A.

As seen in the table, the unemployment rates in the 3 provinces assessed are all above the average unemployment rate of the country during the first quarter of 2019 which is 12%.

12.3 Assessment of Disaster Effects

In Golestan Province, 381 handicraft workshops have been either demolished or damaged. The workshops are located in villages of Kord, Salaq Yalqi, Hakim Abad, Qorban Abad, Qanqorme, Taze Abad, Gamishli Nazar, Qare Qamishli, Niaz Abad, Ali Abad (also known as Fazel Abad), Zav Sofla, Yasqolq, Orjanli, Qodane Olia, Qodane Sofla, Qare Yasr Olia, Gachisoo Olia, Tamarqare Qozi, Bash Oili, Arab Buran, Yasang Olia, Sarcheshme, Chaqrabesh Qaradash, Qaraq, Ab Paran, Bash Olia, Farsian, Aq Qamish, Farang, Qala Tape, Adeldel, Bash Oila, Pano, Hussein Abad Qorbani, Yasang Sofla, and towns of Kalaleh, Turkmen Port and Galikesh. The major handicraft-related professions which were affected by flood in Golestan Province are loom and non-loom based weaving (i.e. rug, palas, felt and carpet), making leather products, making dotar, making traditional clothes, traditional jewelry making, rug weaving, statue making, traditional cover weaving, silk weaving, pelas weaving, felting, and traditional textile.

In Lorestan Province, 150 handicraft workshops have been either demolished or damaged. The workshops are located in Khoram Abad, Noor Abad, Koohdasht, Aligodarz, Pol-e-Dokhtar, Dorood, Afarineh, Mamulan, Boroojerd, and Alshtar. The major handicraft-related professions in Lorestan Province affected by flood are rug and traditional overcoat weaving, making wooden products and metal forging.

In Khuzestan Province, 765 handicraft workshops have been either demolished or damaged. The workshops are located in Izeh, Behbahan, Masjid Suleiman, Rafii, Abadan, Hamidieh, Lali, Andika, and Ahvaz. The major handicraft-related professions in Khuzestan Province which were affected by flood are rug weaving, traditional pottery, felting, cloak weaving, traditional overcoat weaving (i.e. Choqa weaving), patterned cloth (i.e. Buria) weaving, enameled pottery making, wooden grid making, making traditional clothes, rug weaving, making handicraft products, making traditional jewelries.

The total damages to productive assets by province are shown in the following table. Due to time constraints, the production losses due to the damages mentioned in Table 4 were not gathered.

Table 4. Damages to productive assets by province

Sector/Sub-sector	Damage by Province in USD (M)			Total Damage	
	Lorestan	Golestan	Khuzestan	IRR (Billion)	USD (Million)
Agriculture	*	*	*	*	*
Industry and mining	4	18	83	10990	105
Tourism	*	*	*	*	*
Carpet weaving	*	*	*	*	*
Cooperative	5	1	NA**	651	6
Guild	16	4	NA**	2027	20
Home Jobs	2	0.3	0.1	281	2.4
Other economic activities	NA**	3	NA**	347	3
TOTAL	27	26	83	14296	135.9

* Figures relating to Agriculture and Culture and Tourism sectors are reported in their own sector reports.

** Data relating to this province/sector were not available at the time of writing this report

Based on the reports from the Agriculture Sector and the Culture and Tourism Sector as well as from the provincial reports received by the Ministry of Cooperatives, Labor and Social Welfare, the lost employment and their values are shown in Tables 5, 6 and 7. The cost of lost employment is calculated using minimum salary per month (USD 170) multiplied by (roughly) 6 months of unemployment multiplied by the number of the people who lost their job after the flood events.

Table 5. Lost employment in Lorestan

Sector	Number of lost employment	Lost Income	
		IRR (Billion)	USD (Million)
Agriculture	**22,000**	2360.31	**22.44**
Industry and mining	**835**	89.41	**0.85**
Tourism	**349**	37.87	**0.36**
Carpet weaving	**530**	56.80	**0.54**
Cooperative	**560**	59.95	**0.57**
Guilds	**5,062**	542.74	**5.16**
Home Jobs	**2,400**	257.70	**2.45**
TOTAL	**31,736**	3404.77	**32.37**

Table 6. Lost employment in Golestan

Sector	Number of lost employment	Lost Income	
		IRR (Billion)	USD (Million)
Agriculture	**10,992**	1179.10	**11.21**
Industry and mining	**50**	5.26	**0.05**
Tourism	**548**	58.90	**0.56**
Carpet weaving	**3,428**	368.14	**3.50**
Cooperative	**352**	37.87	**0.36**
Guild	**1,618**	173.55	**1.65**
Home Jobs	**300**	32.61	**0.31**
Other economic activities	**293**	31.55	**0.30**
TOTAL	**17,581**	1886.98	**17.94**

Table 7. Lost employment in Khuzestan

Sector	Number of lost employment	Lost Income	
		IRR (Billion)	USD (Million)
Agriculture	**548**	58.90	**0.56**
Industry and mining	**7,991**	857.24	**8.15**
Home Jobs	**163**	17.88	**0.17**
TOTAL	**8,702**	934.03	**8.88**

The total employment lost in the 3 provinces is 58,019 with a total value of IRR 6225.78 Billion (USD 59.19 million) for lost wages. Therefore, immediately after the floods, the number of unemployed people in the 3 provinces have increased to about 326,000 persons or by 21%, as shown in Table 8.

Table 8. Post-disaster employment

Province	Number of Unemployed			
	Before the flood	Additional due to the flood	Total after the flood	% Increase
Golestan	35,879	17581	35,879	50
Lorestan	70,967	31736	70,967	88
Khuzestan	161,027	8702	161,027	5
Total	267,873	58019	267,873	21

12.4 Recovery strategy & needs

The number of people rendered unemployed by the floods is staggering. Moreover, since only half of those employed (783,583 out of 1,620.193) have compulsory insurance, immediate actions are needed in order to restore livelihoods and sources of income. Planning the recovery for livelihood requires a process of anticipating the events and developing capacities, procedures, responsibilities and abilities that could be implemented and applied for a post-disaster context considering Build Back Better (BBB) strategies. The following measures should be implemented in the flood affected areas of 2019 for early recovery, long-term sustainability and capacity building for this sector.

Employment-generating activities should be a priority in the recovery process. Those who were rendered unemployed should be priority for hiring in carrying out reconstruction and risk reduction projects, e.g. road repairs, reconstruction of community infrastructures, construction of levees and dykes, water breaks and retaining walls in order to reduce the risk of natural hazards in future aligned with the BBB strategy.

Informal jobs should be registered and organized in a manner that increases job security for the people working in this sector and enhances the urban functionality. Information collated through such registry could also be used in the studies related to the local economy.

Light agriculture machinery and equipment should be provided to the cooperatives active in production using bank loans and grants in order to facilitate the recovery.

Cash payments should be provided to the affected households in the form of government grants to restart home businesses as soon as possible. This is of particular importance for the vulnerable population including women.

Damaged and washed-away agriculture lands belonging to cooperatives should be prepared for replanting. This could be done using public work labor force providing a portion of the damage society with mid-term employment.

Uncultivated lands belonging to cooperatives should be used for other usages such as livestock breeding. This could provide people who lost their jobs with a substitute employment.

Adequate distribution channels should be provided for the sale of products compiled in damaged markets. Open spaces owned by the government could be temporarily used for this purpose.

Entrepreneurship should be encouraged in the affected areas for creating new opportunities.

Development of green jobs should be encouraged. An example would be establishing permanent solid waste recycling sites which on one hand reduces the environmental diverse impacts and on the other hand provides employments for local labor.

As women are among the vulnerable groups, special attention should be paid to the employment of female labor forces when incentives and supportive policies are implemented.

Provision of technical and vocational training courses in order to prepare required skilled workers for reconstruction process

Marketing studies should be conducted in the affected areas in order to identify new patterns of demand and supply in the region resulting in a better livelihood planning for future.

Short- and medium-term recovery needs

The Ministry of Labor, Welfare, and Social Co-operatives (MLWSC) has devised different approaches in dealing with lost employment. The first approach entails the implementation of supportive and incentive programs to support unemployed persons. These programs include using unemployment insurance payment, encouraging public employment in dredging, reconstruction and repair of public damaged buildings and infrastructure, and enterprise subsidy scheme to incentivize enterprises to attract and employ unemployed population. Table 9 shows the supportive programs to create new jobs for formal and informal laborers in the disaster stricken areas. To calculate the costs, the minimum monthly wage of USD 170 has been used for insurance payment. Other costs have been computed employing a fraction of the minimum wage. These programs are applicable within 18 months (short term). The second approach is the reconstruction, restoration and rehabilitation of affected economic units using bank loans with minimal profit reducing cost of capital for business owners. Table 10 shows the amount of loans needed in order to rehabilitate the lost employment in each sub-sector which the Ministry of Labor plans to facilitate. These programs are done through bank loans in the medium term (18 months to 3 years).

Short term recovery needs

Table 9. Support and incentives to the unemployed

Programs	Amount Needed by Province in IRR (Billion)			Total	
	Golestan	Lorestan	Khuzestan	IRR (Billion)	USD (Million)
Public employment programs	171	286	567	1024	9.74
Unemployment payments	220	343	1815	2378	22.61
Wage subsidies	323	539	1068	1930	18.35
Unemployment payments for the informal sector	160	384	473	1017	9.67
TOTAL	874	1552	3923	6349	60.37

Medium term recovery needs

Table 10. Bank loans and government funds for the reconstruction, restoration and rehabilitation of damaged economic units

Sectors	Amount Needed by Province in IRR (Billion)			Total	
	Golestan	Lorestan	Khuzestan	IRR (Billion)	USD (Million)
Agriculture	*	*	*	*	*
Industry and mining	1872	391	8727	10990	104.48
Cooperative	101	550	447	1098	10.44
Tourism	*	*	*	*	*
Guild	379	1648	350	2377	22.6
TOTAL	2352	2589	9524	14465	137.52

* Figures relating to Agriculture and Culture and Tourism sectors are reported in their own sector reports.

Based on the above tables, the damages and needs to restore livelihoods are shown in Table 9 below. The damages and losses in the agriculture sector and the culture and tourism sector are integrated in the their own sector reports.

Table 11. Summary of damages and recovery needs for livelihood

Province	Damages		Loss*		Total Effects		Needs			
	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	Short term USD (Million)	Medium-term USD (Million)	Long-term **	Total USD(Million)
Lorestan	**2829**	**26.90**	**NA**	**NA**	**2829**	**26.90**	**14.76**	**24.61**	**NA**	**39.37**
Golestan	**2729**	**25.95**	**NA**	**NA**	**2729**	**25.95**	**8.31**	**22.36**	**NA**	**30.67**
Khuzestan	**8738**	**83.07**	**NA**	**NA**	**8737**	**83.07**	**37.30**	**90.55**	**NA**	**127.84**
TOTAL	**14296**	**135.92**	**NA**	**NA**	**14296**	**135.92**	**60.36**	**139.58**	**NA**	**197.88**

* Due to time constraints, the production losses due to the damages mentioned in Table 2 were not gathered.

** Since lost employment should be reinstated as soon as possible, there is no long term recovery plan in these sector.

12.5 Assessment Methodology

Two methods for calculating the impacts to the livelihood and employment sector have been utilized in this report. The first method is based on damage reports submitted by province offices to the Ministry of Labor, Welfare, and Social Co-operatives during the first weeks after the flooding occurred. It is worthwhile to note that these reports are normally inflated by province officials to absorb more funds for recovery activities. However, despite being aware of such inflation in figures, it was agreed not to make any changes to the original numbers since no consensus was made between sector experts during the PBO write-up workshop. The second method is on the basis of using surveyed damage and unemployment data collected unit by unit for each sub-sectors in the affected areas. These estimates, both damages to the business owners and number of employments lost, are more reliable than the damage information submitted by local offices. The number of unemployed people was indirectly computed and the information gathered was cross-checked and validated with the Agriculture sector and the Culture and Tourism sector for consistency. The more reliable figures were then utilized for this chapter. However, in cases where collected damage data was not available (for example in some sub-sectors in Khuzestan), preliminary estimates were used. The production losses are not included since the team was not able to gather them.

References

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2. Information extracted from the website of Statistical Center of Iran

3. OCHA, IRAN: Golestan and Fars provinces floods Flash Update No. 1, 25 March (2019)

4. UNDP (2010), Employment, Livelihood and social protection, Bureau for Crisis Prevention and Recovery.

5. Mozambique Cyclone Idai, Post disaster need assessment, (2019)

6. Post Disaster Need Assessment, flood and landside , Kerala, India (2018)

7. Post disaster need assessment, Tropical cyclone, Gita, (2018)

13. Gender and Social Inclusion

13.1 Summary

Girls, boys, women and men experience natural disasters differently and their pre-existing vulnerabilities are exacerbated during and in the aftermaths of the crises. Social inequalities, including gender stratification of society, are the determinants of the nature and spread of the impacts of particular disaster. The floods resulted in a death toll of 29 across Golestan and Lorestan provinces, out of whom 21 were male and 8 were female, with no age disaggregated data available.[1] By the same token, there were no reports stating the exact causes of deaths.[2]

Evidence from the flood affected provinces in March 2019 shows that among populations stricken by this disaster, girls, boys and women were the hardest hit. Further analysis of this evidence shows that certain social sub-groups including Female Headed Households (FHHs), People with Disabilities (PWDs) and Older Persons were among the most affected.[3] The pre-disaster status of these groups, especially when intersecting with gender inequalities, creates social vulnerability to disasters, resulting in their reduced ability to bounce back to normalcy in the post event. Among the challenges in the pre-disaster event for Female Headed Households are the burden of productive and unremunerated domestic work, under-representation in the formal economy and a higher poverty rate compared to Male Headed Households. The status of PWDs, especially of women and children with disabilities, before the disaster indicates multiple problems of limited access to social services and lack of social participation. Pre-flood data also suggests limited enjoyment of social services, and income security, as well as loneliness, exclusion and lack of a comprehensive care system for older persons in general. Extra burdens for older women are their role as the care giver for children and older men in the household, and their comparatively limited physical mobility due to socio-economic and cultural constraints.

While the material loss can be measured and assessed in monetary terms, the reports demonstrate that women and girls suffer a double disaster by being exposed to other impacts of the crisis that affect their well-being, including their health and Reproductive Health, education and income status. These impacts include but are not limited to increased workload; increased time devoted to reproductive work; decreased and riskier income-generating opportunities; increased dependency on men's income; loss of social and job-related networks; unwanted marriages out of financial necessity; increased stress and trauma; maltreatment; reduced privacy, safety and security; and in the case of girls, interrupted or completely terminated access to education.

While the gender differentiated effects of the loss and damage to institutions, industries and the social protection system have been calculated and reflected in the other sectors' report[4] , this chapter identifies a wide range of factors affecting the gender-based vulnerabilities of FHHs, PWDs and older persons as already stated above. The recommendations propose a targeted investment in women through the upgrading of skills, and the provision of financial support by employing a micro finance scheme and the topping up of targeted cash assistance. They also include an expansion of health care services including those of mental and reproductive health to flood-affected populations to run alongside the targeted investment programme. The total estimated recovery needs of the sector is IRR 4165.86 billion (USD 39.61 million) of which 55% will be allotted to Lorestan province and 45% to Golestan province.

One main concern observed by this assessment was the dearth of sex, age disaggregated data as well as lack of effective systems for data gathering and analysis at the national and local levels. This assessment reveals the importance of attending to the full spectrum of gender-based needs of the potentially marginalised social groups who may be excluded from the recovery process due to their less visible status in the flood affected areas.

1. Natural Disaster Management Organization's report at the write-shop, 31st July 2019
2. There was limited data available from across the affected sites and populations, neither was there any resources available for a more thorough death toll assessment.
3. Reports received from Vice Presidency for Women and Family Affairs (VPWFA) provincial offices on 14th July 2019
4. The strategy also addresses the psychosocial needs of women in the target social groups by establishing Women Friendly Spaces for the provision of relevant support.

13.2 Sector Background

Iran's Human Development Index for 2017 was 0.79, which places it among the countries with high development, ranking it 60 out of 189 countries and territories[1]. With a Gender Inequality Index of 0.461, Iran ranks 109 out of 160 countries[2]. In the absence of the year's published official poverty line, the Household Expenditure and Income Survey (HEIS) 2016-2017 (1396) data suggests three poverty lines in Purchasing Power Parity per person per day which are as follows: IRR 44,220 in rural areas and IRR 66,000 for urban areas excluding Tehran province[3]. The same statistics indicate the percentage of FHHs being under the poverty line as 12.4 percent compared to 9.6 percent for male headed households[4]. According to Statistical Center of Iran's (SCI) FHH report published in 2015, more than 50 percent of FHHs are placed among the lowest three income deciles which make them very vulnerable in terms of income security.[5] Given the discrepancy between the poverty rates of men and women in the rural and urban areas, there has been a trend towards increased feminised poverty; this trend not only compounds the incidence of poverty but also its severity for women[6].

Female Headed Households

The latest national census (2015-2016), demonstrates that 12.5 percent of all households are headed by women (nearly 3 million)[7]. FHHs are not homogenous groups as they comprise married, widowed and divorced women and women who have never married. The socio-economic status of each group of women heading a household differs to some degree, commensurate to their level of education, age bracket, size of the family, household expenditure, etc. According to the 2016 population and housing census more than 50 percent of FHHs are older women who are living without a spouse[8]. In fact, 53.1 percent of elderly FHHs are widowed and the majority of them are living alone[9]. The single elderly FHHs are more vulnerable in many areas particularly due to limited access to income resources, to social networks and health and care services. This situation is greatly exacerbated in emergency and post emergency settings.

In the pre-disaster context, reports indicate that unemployment, lack of social security, discrimination, low social status and lack of choice were reported to be the predominant concerns of the FHHs.

Table 1: FHHs's labour Force participation in Golestan and Lorestan provinces[10]

FHHs Employment	Lorestan	Golestan	Country
Number of FHHs	66,373	66,553	3,061,753
Percentage of Employed FHHs[11]	7,182	11,112	448,265

The main entities that are providing services to FHHs in both provinces of Golestan and Lorestan are the State Welfare Organisation, Imam Khomeini Relief Foundation and the Martyrs Foundation.

1. UNDP Human Development Indices and Indicators Report (2018)
2. UNDP Human Development Indices and Indicators Report (2018)
3. Household Expenditure and Income Survey (2016-2017)
4. Ibdl.
5. Statistical Research and Training Center, Health and Socio-economic Status of Female-Headed Households: Support Policies and Programs, 2014, p20
6. Household Expenditure and Income Survey 2016-2017 (1396)
7. Population and Housing Census (2016)
8. Ibdl.
9. Ibdl.
10. Census 2016
11. This figure does not necessarily include all women active in private /informal sectors and homebased occupations.

People with Disabilities

Iran's Multiple Indicator Demographic and Health Survey (IrMIDHS-2010) reports the percentage of PWDs to be 17.2 per 10,000 of the population[1]. It also breaks down the prevalence of disability for rural and urban areas disaggregated by sex as indicated in the table below:

Table 2: Prevalence of disability per 10,000 persons in Iran[2]

Gender / Rural /Urban	Prevalence of disability per 10,000 persons
Total	17.27
Male	22.41
Female	11.91
Urban	16.46
Rural	19.07

Iran's Parliament ratified the Convention on the Rights of Persons with Disabilities (CRPD) on October 23rd of 2009 with a general reservation. The "Welfare Rights" segment of the Iranian Constitution (approved in 1979; amended in 1989) states that those with disability should benefit from Iran's social security system. There is also another legal provision for "The Protection of People with Disability" that provides legal protections for PWDs in areas such as public building access, education, housing, and finance[3]. Included in this legislation are segments relating to the employment and inclusion of disabled persons in the workforce.

PWDs, depending on their age group and type of disability, are reported to face challenges in the pre-disaster context. Children with disabilities experience the following problems: difficulties in regard to their transportation to and from school (particularly for the children living in deprived or rural areas with limited access to the schools); unavailability of the appropriate schools and communal spaces for children with disability; lack of access to school buildings; stigma; discrimination; isolation; being made fun of; bullying or harassment by non-disabled students; the unaffordability of the high healthcare costs; lack of accessibility of healthcare centres; limited availability of disabled child friendly services and inadequate skills and knowledge of health workers in dealing with children with disabilities.[4] For the adults, the challenges equally encompass a broad range of concerns and obstacles, chief among which are reported to be: income insecurity; dependency on their care givers; social exclusion; maltreatment and neglect; shifting patterns of disease and disability by aging; limited access to or unavailability of healthcare services, particularly in the rural areas; lack of mobility and consequent limitations on making personal choices; inadequacy of services; shortage of skilled social and health workers; fear of being left alone; fear of being left behind at the time of emergencies and severe economic hardships, etc.

Women and girls with disabilities confront multiple discriminations and are considerably more disadvantaged than men and boys with disabilities in similar circumstances. They are often deprived from many of their social entitlements, specially by virtue of the lesser status ascribed to them by existing social norms, or as a result of overt or covert discrimination. Women with disabilities experience particular disadvantages in the areas of education, income generation, maltreatment, health and reproductive entitlements. As a consequence of gender preconceptions in labour market, women's productive potentials are generally less effectively tapped than men with disabilities.

The State Welfare Organisation (SWO) and Ministry of Health, Education and Medical Science (MOHME) are the key entities responsible for PWDs in the affected provinces of Golestan and Lorestan. SWO and MOHME offer a series of diagnostic, screening and rehabilitation programmes. There is also a health and

1. Iran's Multiple Indicator Demographic and Health Survey (2010)
2. Census 2016
3. Iran's Comprehensive Law for Protection of People with Disability (2018)
4. Reports received from SWO, compiled by VPWFA's provincial offices, 18 July 2016

educational preparedness screening programme which is implemented by the Special Education Organisation (SEO) for new students before starting pre-primary and primary schools. IRCS renders a comprehensive, multi-specialty rehabilitation service across the country in addition to the provision of surgery and rehabilitation services to children with disabilities, including refugee/ migrant children.

Older Persons

The 2016 census implies that close to 9.28 percent (7.4 million) of the country's population is 60 years and over in which the percentage of women slightly outnumbers men[1]. The literacy rate of persons over 60 stands at 46 percent[2]. Only 34 percent of women and 59 percent of men aged 60 and over are literate. The employment rate of persons aged 60 and over is around 18 percent. The table below shows the status of the Older Persons in provinces of Golestan and Lorestan.

Table 3- Older People status in the pre-flood situation[3]

Old People (Over 60)	Lorestan	Golestan	Country
Number of elderly women	79,744	123,978	3,755,686
Number of elderly men	75,727	114,415	3,658,405
Number of elderly female heads of households	34,282	29,029	1,491,419
Number of elderly male heads of households	74,391	67,904	3,571,570
Number of literate elderly women	12,923	15,295	1,275,580
Number of literate elderly males	23,698	35,336	2,163,868
Number of illiterate elderly women	66,798	60,415	2,478,137
Number of illiterate male elderlies	45,108	34,614	1,491,705

With socialization being a significant part of healthy ageing process, Older Persons are comparatively more exposed to the risk of loneliness than the other age groups. Not having someone to turn to, for assistance, support and care, especially at the times of crisis, can prove to be a major problem in particular for older women who hold lower socio-economic status. The table below shows the differences between the percentage of men and women living alone in Golestan and Lorestan provinces.

As indicated in the figure, the percentage of older women living alone to all older women in each of two provinces is higher than those of older men.

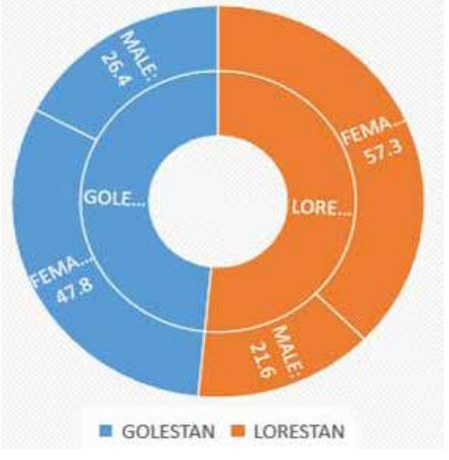


Figure 1: Percentage of Older Persons living alone by sex and province[4]

1. Population and Housing Census (2016)
2. Ibdl.
3. Census 2016
4. Population and Housing Census (2016)

13.3 Assessment of Disaster Effects

Effects on Female Headed Households

Post-disaster evidence from the above mentioned two provinces hit by the flood demonstrates that the challenges of FHHs in terms of livelihoods, access to social services including health and Reproductive Health services, maltreatment and social status are exacerbated after the disaster. To these challenges, the newly emerged psycho-social and mental health needs, lower personal security and lack of new and substitute job opportunities are added in the post crisis event.

Field reports are indicative of FHHs' substantial loss of jobs both in the formal and informal sectors. Some of these losses are due to the loss of or damage to the productive sector in which they used to work, such as the handicrafts and tourism industries. Some loss of employment are because of the loss of their own income-related assets, including their home-based jobs such as carpet weaving, hair dressing, sewing, embroidery, etc.; some because of the destruction of seasonal work and others because of the long-term cessation of productive activity in the sector, such as in the case of agricultural lands which will not be cultivated for an extensive period of time.[1]

By and large, FHHs in the flood-stricken areas are reported to take on more unpaid reproductive work, which noticeably decreases their access to income generating opportunities. The extended period of unemployment for many of the FHHs has forced them to take out loans, or to borrow money from their relatives, thus causing them to run the risk of falling into the debt cycle.[2] Lack of employable skills along with a low level of education and lack of job opportunities - especially for those whose previous work sector does not function any more - prove to be a serious challenge in both flood-affected provinces. Furthermore, FHHs which include people with special needs including older persons and / or PWDs are at a far greater disadvantage.

While all the pre-existing hardships for FHHs are aggravated by the flood in the flood hit areas, women who carry the double burden of child rearing and income generation are in jeopardy of malnutrition as they have the obligation to prioritise feeding their children. The same anecdotal report by VPWFA also suggests that the intra-household distribution of foods in those households with male members, plays a major role in determining the nutrition status of the other members, as the food can be prioritised for men and boys.

Reported increases in maltreatment of women and girls in general, and toward FHHs in particular, compound their existing vulnerabilities. FHHs face heightened rates of maltreatment in the post disaster phase due to their lower social status, the lack of protective measures, exposure to unsafe conditions in their new residence or workplace, and the necessity to travel greater distances to reach these locations, and changes in the type of work which might not provide them with enough safety and security. Power imbalances between male employers and female workers, especially for those who have stooped to take on lower level unskilled jobs after the flood, are a breeding ground for maltreatment towards women. The SWO social emergency hotline reported that maltreatment toward women and girls in the affected provinces has escalated in some families as a result of increased tensions and needs. There are also reports showing a noticeable rise in the mental health needs of women in general and FHHs in particular after the flood. [3]

1. VPWFA's compilation of reports from Golestan and Lorestan province, 24 July 2016
2. Ibdl.
3. VPWFA complied reports on Golestan and Lorestan provinces, 24 July 2019

Table 4: Status of FHHs in post-flood situation in Lorestan and Golestan Provinces 1

Indicator		Golestan	Lorestan	Total
1	Number of FHHs supported by SWO and IKRF before flood	43,063	48,486	91,549
2	Number of FHHs after flood	46,263	49,157	95,420
3	Number of FHHs who have lost their jobs after flood	403	305	708
4	Number of FHHs who have lost their only source of income after flood	403	305	708
5	Number of FHHs who have lost their shelter /housing after flood	2,947	4,964	7,911
6	Number FHHs who have lost their essential life appliances [2]	2,130	1,401	3,531
7	Number FHHs who are illiterate	1,850	1,428	3,278
8	Number of FHHs with mental health problems after flood	7,294	7	7,301
9	Number of FHHs with malnutrition after flood	12	0	12
10	Number of FHHs who experienced maltreatment (physical, verbal, …) after flood	2	0	2

Effects on Older Persons

The field reports indicate that older persons are among the most vulnerable social groups and those least visible during and after the floods. Many of them are reported to experience considerable disruption, most notably in relation to their mobility, but also in regard to their medication, health and rehabilitation care services. Moreover, for those economically active, their income earning chances are reduced and complicated. [3] Consultations with the affected communities confirm that these challenges are intensified for older women due to their lower socio-economic status in society. They are also more exposed to neglect and maltreatment. Many of them suffer from post event distress, depression, and other mental and psychological problems. [4]

The reported accentuated impacts of floods on older persons can to a large degree be explained by their life experiences in the pre-disaster context. Older women are more likely to have had a lifetime of disadvantage. They have had more chances of becoming economically marginalised, of having lower nutritional and educational status and restricted access to services and the labour market in earlier life, often leaving them with poor health and meagre resources in old age.

Table 5: Status of Older Persons (60 years and above) in the post-flood situation disaggregated by sex[5].

	Indicator	Lorestan		Golestan		Total	
		Female	Male	Female	Male	Female	Male
1	Number of Older Persons supported by SWO and IKRF centers before flood	52,690	53,209	15,526	3,290	68,216	76,499
2	Number of Older Persons who referred to SWO and IKRF centers after flood*	46,302	32,799	18,227	7,535	64,579	60,334
3	Number Older Persons who are illiterate	124	154	Not reported	Not reported	124	154
4	Number of Older Persons who developed mental health problems after flood	70	45	20	30	90	75

1. Reports provided by SWO and IKRF at the PDNA write-up workshop 30&31 July 2019
2. They refer to basic appliances like refrigerators, cooking stoves, heaters, carpets, etc.
3. Reports provided by SWO and IKRF at the PDNA write-shop 30&31 July 2019
4. Reports from VPWFA provincial offices, 18 July 2019
5. Reports provided by SWO and IKRF at the PDNA write-shop on 30th and 31st July 2019.

	Indicator	Lorestan		Golestan		Total	
		Female	Male	Female	Male	Female	Male
5	Number of Older Persons who have lost their shelter	2,239	3,369	2,577	1,648	4,816	5,017
6	Number of Older Persons who have lost their only source of income after flood	308	103	Not reported	Not reported	308	103
7	Number Older Persons who have lost their Essential home appliances and equipment after flood	2,546	3,678	1,750	400	4,296	4,078

*Indicates the number of people who referred to the centers after the disaster. It shows a decrease in the number of older persons referring to their centers after the flood.

Effects on People with Disabilities (PWDs)

According to the IrMIDHS survey (2010), 17.18 percent of the total country's population have some kind of disability. The following tables indicate the number of the PWDs in the provinces of Lorestan and Golestan in the post-flood situation.

Table 7: Status of PWDs[1] who referred to SWO and IKRF in the post-flood situation [2]

	Indicator	Lorestan		Golestan		Total	
		Female	Male	Female	Male	Female	Male
1	Number of PWDs supported by SWO and IKRF before flood	500	534	Not reported	Not reported	500	534
2	Number of PWDs supported by SWO and IKRF after flood	63	65	684	936	747	1001
3	Number PWD who are illiterate	63	65	0	0	63	65
4	Number of PWDs who have lost their income[1] after flood	130	650	14	67	144	717
5	Number of PWDs who have lost their only source of income after flood	0	0	40	80	40	80
6	Number of PWDs who have lost their assistive devices after flood	Not reported	Not reported	452	512	452	512
7	Number of PWDs who have lost their essential home appliances after flood	63	65	280	600	343	665

It is evident from the anecdotal reports from the flood-stricken areas of Lorestan and Golestan that vulnerabilities of the persons with disabilities during and after the floods are not only due to aspects of their disabilities, but also because of their chances of experiencing more adverse socio-economic outcomes of the floods than persons without disabilities. Reports from both provinces point to the loss of or damage to assistive devices in the course of movements during and after the crisis.

PWDs experience further discrimination due to one or more intersecting factors of which gender, age, and the economic status of the household; are a part. Though precise statistical data is not available in the post-disaster context, the challenges that women and girls with disabilities reportedly face after the disaster in the two provinces, include significantly less access to education, healthcare and employment than men with disabilities or women without disabilities.

1. Shows an increase of 13% for females and 12% for males in the number of persons with disabilities referring to the SWO or IKRF centers in Lorestan province after floods.
2. Reports provided by SWO and IKRF at the PDNA write-shop on 30th and 31st July 2019.

١. Income refers to independent income

Women, girls and boys with any form of disability are reported to face a greater risk of maltreatment than men with disabilities.[1] Albeit, there is anecdotal evidences pointing out that children with disability experience more maltreatment in the post event situation, the incidence of this may be under-reported because of their comparatively limited agency, and at times, restricted access to health services including mental health counselling and the justice sector and their dependency on the care giver. Based on the few reports received, there is a higher stigma for boys culturally than for girls who have experienced certain types of maltreatment. This to a large extent limits the number of cases of maltreatment reported either to family members or to healthcare/social workers, the police or the justice sector.[2] There are references in the reports of these provinces alluding to the pre-existing conditions and norms which have amplified the impacts of the floods for women and girls with disability. This includes the generally lower economic status of females with disability, fewer job opportunities, the lower employment rate, more limited access to and enjoyment of social protection services and the persistence of social norms excluding women and girls with disability.[3]

Other Social Groups Affected by the Disaster

The anecdotal reports indicate the heightened vulnerability of other social groups, such as people involved in substance abuse, people with HIV/AIDS, refugees, working children, street children, etc.[4] Though the time span of the preparation of this report did not allow for concise data gathering on these groups, the existing evidence suggests that the women involved in substance abuse or those in recovery, due to their lower socio-economic status, have been far more affected by the flood and consequent deteriorated economic conditions in the post-flood period than men.

The available evidence reveals relapse to substance abuse as a result of the trauma for those who were in recovery. The scattered and limited data available does not specify the spread, prevalence or patterns of the substance abuse but it shows the existence of Acute Stress Disorder, Post-Traumatic Stress Disorder (PTSD) and depression. Women involved in substance abuse, who were anecdotally reported, stated the reason for their relapse and their increased vulnerability in the post-disaster situation was due to exposure to the traumatic life events both during the floods and in the subsequent post event situation.[5]

According to VPWFA, there are NGOs which are funded by the Government tending to the needs of women and girls involved in substance abuse in the disaster-affected provinces. The main government entities responsible for responding to the needs of people involved in substance abuse are MOH and SWO.

13.4 Recovery Strategy & Needs

Taking into account the distinct needs and capacities of each social group, the recommended strategy adopts resilience building, community engagement and capacity enhancement approaches. To safeguard, re-establish and enhance the participation of the above mentioned social groups the recovery strategy, to the greatest extent possible, strives to involve the community in restoring and improving their life conditions. To ensure sustainability, it also endeavours to build on the existing government programmes, while mainstreaming gender concerns in the responsive services. The strategy, as outlined below, revolves around the following main areas of gender-based needs of the above mentioned social groups:

Livelihoods

While the general deterioration of livelihoods after the floods has affected the lives of the majority of inhabitants, in particular the aforementioned social groups, it is reported to have had disproportionate effects on women and girls. As women's contribution to the household economy is significant, they will not only be a critical partner in the rapid recovery of their own households but also in the wellbeing of the entire affected population.

The strategy takes into consideration the differences of the various types of households, such as those who have lost their sources of income for an unseen period of

1. VPWFA provincial reports, 18 July 2019
2. Ibdl.
3. Ibdl.
4. VPWFA provincial reports, 18 July 2019
5. Ibid.

time, those whose income does not suffice to support the family they head, those whose vocational skills cannot be utilised to generate income in the post-disaster situation, etc. It has been foreseen that compensation will have to be provided to FHHs who are expected to be covered by the micro-finance programme, with the objective of avoiding increased debts resulting from their lost assets, and the necessity to pay for flood-induced higher prices for accommodation, food, transportation, etc. New vocational skills, including those of marketing together with literacy and life skills training, are included in the programmes to enhance the capacities of those FHHs who need to start a new job, based on the demands of the market. The strategy also aims at providing allowances for those women, be they elderly or FHHs, who are unable to work, through providing increased monthly cash assistance for the duration of two years.

Although some of the FHHs as well as elderly women have been receiving cash assistance from either the IKRF or SWO prior to the floods until now, the amount of the assistance does not suffice to enable them to cope with their post-disaster life conditions. Therefore, the proposed recovery programmes to enhance the livelihoods of FHHs and elderly women strive to provide increased cash assistance commensurate to the post-disaster needs of these women.[1] As part of the recommended recovery strategy, cash assistance programmes should be supported to conduct protection assessments on gender-based maltreatment risks, types and trends that result from cash assistance and correspondingly put in place mitigating measures to prevent potential harms to groups such as FHH, elderly women and other vulnerable groups.

The SWO and IKRF are the main entities providing financial assistance to the FHHs in both provinces.

Health Care Services Including Reproductive Health and Mental Health Services and Commodities

MOHME is the responsible government entity to respond to health needs, including those of Reproductive Health. The recommended strategy aims at expanding already existing medical and health care services, offered by the health houses to the flood-affected areas.

As far as emotional and mental health counselling and services are concerned, the strategy proposes expansion of the SWO's social health base and community-based services which have a social health-based mandate. The SWO's social health base and community-based services include a range of activities to identify and respond to mental health problems in the community as well as detecting existing and future social harms.

As mentioned above, the SWO's social health base services in the cities and Community Based (CB) services in villages play a significant role in referring the cases that require further mental health follow ups to the concerned entities such as MOHME or SWO central departments and offices. The strategy also addresses the psychosocial needs of women in the target social groups by establishing Women Friendly Spaces for the provision of relevant support.

In so far as provision of compensation, either in kind or in cash, to the PWDs who have had their assistive devices lost or damaged, the SWO's community-based rehabilitation programme is an integral part of this strategy. It plays a central role in identifying the PWDs needing assistive devices and conveying the bottom up demands to the rehabilitation department of the SWO. This strategy requires the SWO to provide assistive devices free of charge to those PWDs who have had their assistive devices lost or damaged during the floods.

Participation of Women including FHHs, Older Persons, and PWDs in Decision Making

The strategy utilises two different approaches: a community-based approach through implementation of the gender-responsive Community Based Rehabilitation programme (please see Annex I for more details) which is exclusive to PWDs in the cities as well as Community Based services which cover the PWDs in villages. While the strategy intends to make the voices of the above mentioned social groups heard through these services, attempts are made to have protocols developed by the responsible government bodies to ensure the participation of Women including FHHs, PWDs and older persons in the existing councils and unions that make decisions for the reconstruction of the community infrastructure as well as those for the overall well-being of the inhabitants.

1. Cash programmes that do not include mitigating measures against harms have been documented to increase risks to vulnerable groups in the wake of natural disasters.

Social Gender-based Issues Including Social Norms

The strategy also uses the same means as for enhancing participation for the detection and consequent response to maltreatments and also other personal security concerns which have arisen in the post-disaster situation for the social groups in question. Moreover, awareness-raising on the nature of the maltreatments and also the existing mechanisms to address such behaviours are encompassed in the strategy, by way of strengthening the SWO's Social Emergency hotline and the introduction of its services to the affected populations.

Given that gender-differentiated needs can differ from one province to other, the strategy aims at strengthening the national dialogue initiative among sociologists, gender experts, responsible government ministries and communities, to discuss the obstacles for different sexes in terms of access to the social services. In parallel to this, communication programmes are required by this strategy to raise public awareness on the said topics as well as to reduce socio-cultural barriers to the full integration and participation of these social groups in society. As far as inclusive Disaster Risk Reduction is concerned, it is necessary to ensure that early warning systems reach persons with disabilities and older persons at the time of disaster while taking into account the gender differentiated vulnerabilities.

Limited Real Time Monitoring and Tracking of FHHs including older women

In view of the scarcity of sex and age disaggregated data, the recommended strategy strives to collect, register and analyse data in the relevant life dimensions of the target groups as explained above. For FHHs, it proposes a comprehensive data gathering, reporting and monitoring system for the real time tracking of FHHs in affected areas including socio-demographic, economic, health and Reproductive Health indicators to respond effectively to their vulnerabilities. Vulnerability assessments should be conducted prior to each programme. The sex and age disaggregated information obtained from such assessments can serve as a baseline for further analysis and also as a baseline for possible future disasters.

Disrupted Social and Economic Networks

The adopted strategy also takes into account the flood-induced disruption of socio-economic networks and support for FHHs, PWDs and older persons, and attempts to mend and rebuild them through community-based programmes as well as activities that involve the target groups in social gatherings, unions and councils such as village councils. As the programmes aim at increasing the mobility, self-reliance and participation of the targeted people, it is expected that they will regain an improved social and economic support and establish new networks.

Recovery Needs

With the data on post-disaster needs being scarce, it was not possible to differentiate the needs in the two provinces. The estimates were provided by the SWO and IKRF based on inputs received from their local staff. Detailed assessment by SWO and IKRF in both provinces will determine the exact allocation of funds. Based on VPWFA's suggestion, the report indicates a budget allocation for each province - 55% for Lorestan and 45% for Golestan. The programmes proposed below are applicable to Lorestan and Golestan.

Table 8: Recovery Strategies and Needs by Sub-sector

Recovery Needs (0-2 years)	IRR (Billion)	USD	Responsible entity
Subsector 1. Female Headed Households			
Strategy 1.1. Ensuring improved livelihoods and enhanced capacity for FHHs			
1.1.1. Provide vocational training for unemployed FHHs whose previous jobs have ceased for a long while (such as women working in agriculture)	71.4	678,816.92	VPWFA, (TVTO)
1.1.2. Provide training on marketing skills for FHHs who are engaged in self-owned businesses fabricating products			
1.1.3. Provide loans to FHHs to ensure availability of seed capital to start and restart businesses			
1.1.4. Implement a micro-finance scheme for FHHs who have lost their own business, home based or otherwise, as well as those who are obliged to change their jobs and start a new occupation	738.36	7,019,765.55	MOCLSW, IKRF
1.1.5. Provide on-off cash assistance to compensate for the time that the FHHs have not worked after the crisis	109.83	1,044,180.14	SWO, IKRF
1.1.6. Request for proposals to private sector for generating employment for FfHs	506.1	4,811,614.04	SWO IKRS
1.1.7. Grant loans, incentives and facilities for the selected private sector enterprises that employ FHHs			
1.1.8. Provide temporary cash assistance on a monthly basis for 0-2 years to FHHs aged 60 and above as well as FHHs with disability who have lost their source of income and are unable to work	4.83	45,919.97	SWO IKRS
1.1.9. Provide out of working hours' adult literacy classes for illiterate FHHs	2.94	27,951.28	SWO, LMO (MOE)
1.1.10. Support the State Welfare Organization in expanding their health bases in the flood-stricken areas in the two provinces of Golestan, Lorestan through establishment of Women Friendly Spaces to provide psycho-social support to all women including FHHs	84.15	800,000	MOCLSW
Strategy 1.2. Strengthening monitoring mechanism[1]			
1.2.1. Support MOCLSW to develop a comprehensive monitoring mechanism including data reporting system for real-time tracking of FHHs in affected areas including socio-demographic, economic and health indicators to respond effectively to their vulnerabilities	26.30	250,000	SWO
Subsector 2. Persons with Disabilities (PWDs)			
Strategy 2.1. Support the SWO expand their Community Based Rehabilitation (CBR) programme services to flood-stricken areas			
2.1.1. Ensure provision of Community Based Rehabilitation (CBR) services to PWDs, with a focus on women, girls and boys	244.86	2,327,942.73	SWO
2.1.2. Provide cascade training to CBR workers on a gender-sensitive and child-friendly modality of operations	4.89	46,518.92	VPWFA
2.1.3. Include gender-sensitive and child-friendly obligations and tasks in the terms of reference and protocols of CBR workers			VPWFA, SWO
Strategy 2.2. Ensure improved livelihoods and enhanced skills for Women with Disabilities			
2.2.1. Implement a micro credit scheme for women with disabilities who have lost their own business, home based or otherwise, as well as those who are obliged to change their jobs	118.86	1,130,030.52	MOCLSW

1. To be implemented in the affected provinces, with the objective of using this as a model to be replicated at the national level.

Recovery Needs (0-2 years)	IRR (Billion)	USD	Responsible entity
2.2.2. Provide vocational training for unskilled and unemployed women with disabilities	1,224.93	11,645,703.20	MOCLSW
2.2.3. Provide compensation (in cash or in kind) for those women, girls and boys who have lost their assistive devices during the floods	151.2	1,437,494.65	SWO
2.2.4. Provide temporary cash assistance on a monthly basis for women with disabilities who live alone	4.83	45,919.97	MOCLSW, IKRF
Subsector 3. Older Persons			
Strategy 3.1. Ensure improved access of the older persons, in particular, older women, to income generating opportunities and to manage their finances			
3.1.1. Provide micro finance loans for economically active older women with an emphasised focus on widows and married older women head of households	91.5	869,883.92	MOCLSW SWO
3.1.2. Design and conduct training programmes to build Older Persons' knowledge of and skills' base in budgeting, prioritising expenditure and cash flow, and the use of loans	2.94	27,951	SWO
Subsector 4. Common Recovery Needs for Women including FHHs, PWDs and Older Persons			
Strategy 4.1. Ensure inclusive provision of medical /health care services to Women including FHHs, PWDs, Older Persons			
4.1.1. Devise gender/ child/ disabled/ elderly friendly Standard Operating Procedures (SOPs) and terms of reference for inclusive health services provided	199.71	1,898,690.85	MOHME. SWO VPWFA
4.1.2. Support the MOH to provide mobile medical teams to cover villages where either health posts are not available, or they are not accessible to Women including FHHs, PWDs and Older Persons.			
4.1.3. Provide supplemental medical insurance for FHHs			
Strategy 4.2. Ensure consistent provision of mental health/psycho-social support services to Women including FHHs, Older Women, girls and boys with Disabilities			
4.2.1. Devise gender sensitive/ disabled friendly and elderly friendly tasks and obligations in the terms of reference and protocols of the SWO health base and home care centers as well as health houses.	32.24	306,465.87	SWO
4.2.2. Support SWO to expand the social health base and home care center services through formation of social health teams (peer help groups) to flood-affected areas.			
4.2.3. Expand the National dialogue initiative to provinces with the objective of preparing the ground for enhanced social capital and family coherence with an emphasis placed on women including FHHs, PWDs specially women with disabilities and older women	21	199,652.04	VPWFA
Strategy 4.3. Ensure enhanced social integration of FHHs, PWDs and Older persons			
4.3.1. Organize a series of TV and Radio programmes for provincial TV and Radio stations.	21	199,652.04	VPWFA
Strategy 4.4. Ensure enhanced status of PWDs, Women including FHHs and Older Persons in family and society			
4.4.1. Support SWO to expand its social emergency services (social emergency hotline) to flood-affected areas	294	2,795,128.49	SWO
Strategy 4.5. Ensure enhanced safety/security at personal and societal levels for PWDs and Older Persons and FHHS			

Recovery Needs (0-2 years)	IRR (Billion)	USD	Responsible entity
4.5.1. Support SWO to organise a culturally appropriate campaign in villages and cities on the necessity and modality of the SWO social emergency hotline operations	210	1,996,520.35	VPWFA, SWO
4.5.2. Conduct a training programme for the members of the village councils, city councils, provincial councils on the necessity of the psychosocial support and recognising the different types of gender-based maltreatments.			
Strategy 4.6. Support participation of women and children - including FHHs and older women, women, girls and boys with disabilities.			
4.6.1. Prepare obligatory protocols and directives for involving Women including FHHs, PWDs (men, women, girls, boys) in decision making processes of the village and city councils and communicate the same to the relevant entities.	0		VPWFA, MOI, city/ village council
Total budget for Golestan (45%)	1,874.64	17,822,611.23	
Total budget for Lorestan (55%)	2,291.22	21,783,191.51	
Total	**4165.86**	**39,605,802.74**[1]	

In discussion with VPWFA, it was agreed that the above-mentioned recovery needs will be met in 2 years. Hence the following table classifies the recovery needs into short term and medium term with 75% and 25% delivery of the recovery needs, respectively.

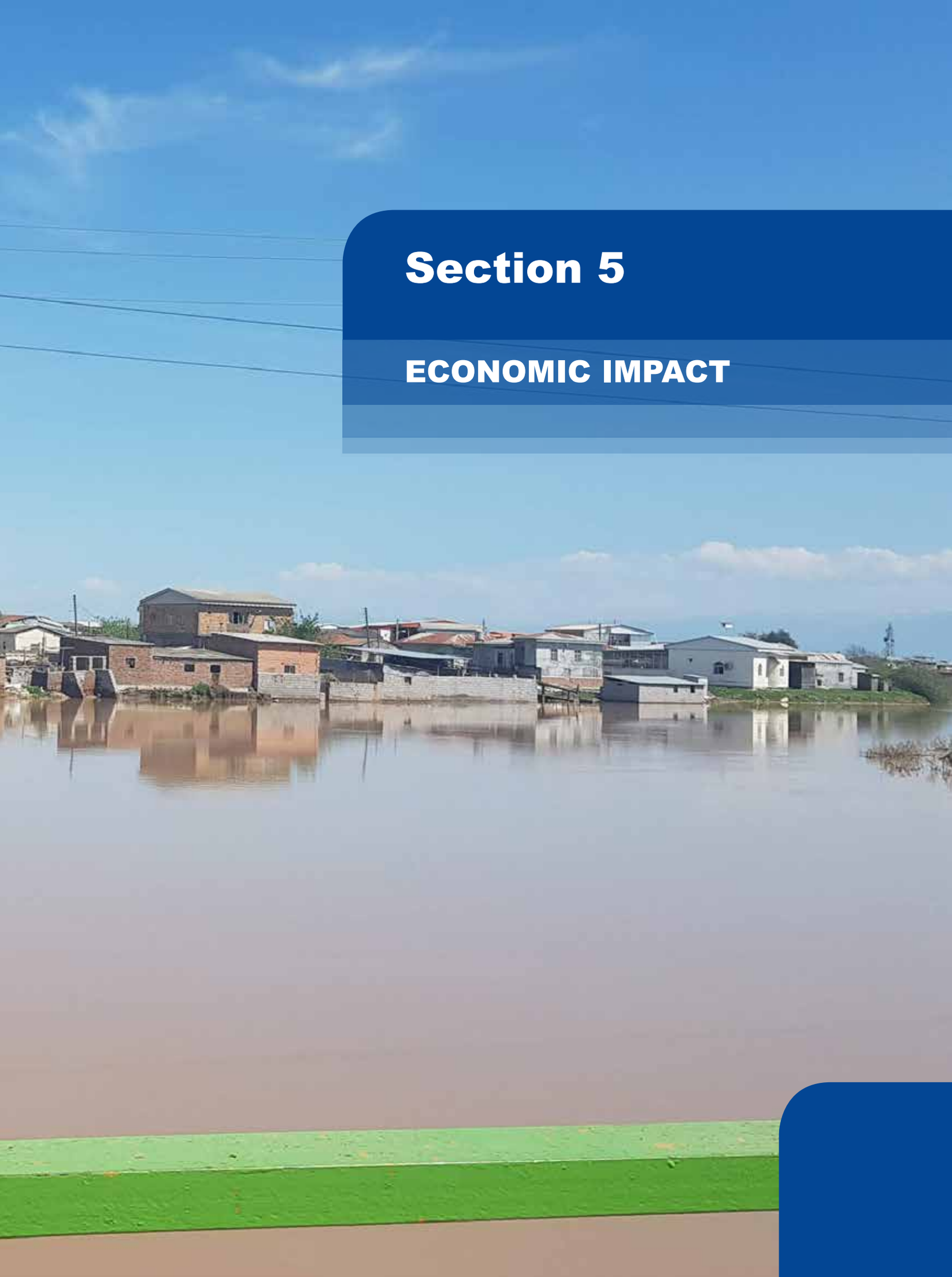
Table 9: Short- and Medium-term Recovery Needs by Province

Province	Short-term		Medium-term		Long-term *		Total	
	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)	IRR (Billion)	USD (Million)
Lorestan	1718.42	16.34	572.81	5.45	-	-	2291.22	21.78
Golestan	1405.98	13.37	468.66	4.46	-	-	1874.64	17.82
Total	3124.40	29.70	1041.47	9.90	-	-	4165.86	39.61

13.5 Assessment Methodology

The exercise was conducted under the guidance of VPWFA, utilising mainly secondary data sources. Baseline information was drawn mainly from the Population and Housing Censuses in 2011 and 2016, UNDP 2018 Human Development Indices Report, IrMIDHS (2010) as well as reports received from SWO, IKRF and VPWFA's provincial offices. Quantitative data was collected by VPWFA's representatives in the flood hit provinces of Golestan and Lorestan. Most of the post disaster data provided in this report was communicated from SWO and IKRF in consultation with VPWFA in the write-shop which was organized jointly by PBO and UNDP. The data collection for this assessment faced a severe lack of sex and age disaggregated data for the affected population, for both before and after the flood.

1. As decided by VPWFA, SWO and IKRF, the recovery programmes for both provinces will have the same nature, but the precise allocation of funds will differ while a thorough assessment of needs in both provinces are conducted by responsible entities. However, it has been estimated that 55% of the requested budget will be allotted to Lorestan province and 45% to Golestan province.



Section 5

ECONOMIC IMPACT

14. ECONOMIC IMPACT

14.1 National economy at a glance

Based on preliminary estimates, gross domestic product at both basic and current prices increased from IRR 11.129 trillion in 2015-16 to IRR 12.723 trillion in 2016-17 indicating a 14.3 per cent nominal growth. Considering the changes in the general price level, preliminary data on the real sector of the economy point towards a 12.5 per cent increase in GDP in 2016-2017 (at constant 2011-12 prices) against a 1.6 per cent growth in 2015-16. This indicates a remarkable GDP growth in 2016-17 compared with 2015-16.

The most recent estimates from the Central Bank of Iran (CBI) and Statistic Centre of Iran (SCI) show that Iran's economy is the second largest economy in the middle east region with an estimated national income (net GNI at basic current price) at IRR 10,300 trillion in 2016 (Central Bank of Iran, 2017). Following some years of recession, the Iranian economy recovered in 2014 with JCPOA (Joint Comprehensive Plan of Action) agreement and expanded by 3 per cent. In the same period, inflation declined from 29 per cent in 2012 to 12 per cent in 2017. However, following the US withdrawal from the JCPOA in 2018 and the oil sales constraints, there was a significant devaluation of the IRR which resulted in macro-economic shocks.

Therefore, in March 2019, inflation stood at 30.6 per cent- estimates of GDP indicate a fall in the growth rate by 3.8 per cent; and unemployment stood at 12 per cent (Statistic Center of Iran, 2019) - with possible further falls in employment.

Iran's population in 2019 is around 83 million people, with a growth rate of 1.24 per cent between 2011 and 2016 (Statistic Center of Iran, 2019). Life expectancy at birth stood at 76 in 2016 - having increased by nearly 21 years between 1980 and 2016. The Human Development Index (HDI) was 0.798 in 2017; Iran's HDI value stands as 60th out of 189 countries – having increased by nearly 58 per cent between 1980 and 2017. Additionally, mean years of schooling and expected years of schooling have increased by 5.7 years and 6.5 years respectively between 1980 and 2013. The number of available jobs reached 22.6 million in 2018, increasing by 2.8 per cent from 2017. In 2018, the highest increase in the number of jobs, by approximately 462.8 thousand, was related to the services sector. Moreover, 99.2 thousand and 53.4 thousand new job opportunities were created in the agriculture and industry sectors, respectively.

Employment shares in services, industry, and agriculture sectors were respectively 50.1, 31.9, and 18.0 per cent in 2018- with 0.7 per cent increase in the share of the services and 0.6 per cent decrease in the share of the industry sector. Employment share in the agriculture sector remained unchanged between 2017 and 2018.

It is noteworthy that the employment in the industry sector has continually fallen over the past three years while its share in the services sector has been on the rise during the same period. Considering that the floods on March and April 2019 affected 26 out of the 31 provinces (Ostans) in the country, the regional figures for the service sector may need to be revised.

14.2 Economic impacts of the 2019 floods: National Assessment

The widespread floods, from mid-March to April 2019, impacted the Islamic Republic of Iran on a large scale. Of its 31 provinces, 26 were flooded. Overall, 1,900 cities and villages across the country have been damaged. The damage was estimated at $4.7 billion USD (2019 USD) including hundreds of millions of dollars' worth of damage to the water and agriculture infrastructure. In addition, the severity of the floods was greatly increased as flood routes and dry riverbeds were converted for urban development without providing proper drainage infrastructure.

According to an Iranian official, the record rainfalls had the following impacts:

- more than 70 people were killed, 10 million affected, and 500,000 displaced – half of which were children, and 2 million people in need of humanitarian aid,
- over 1,000 health facilities and 1,000 schools destroyed or severely damaged forcing 100,000 children out of school and depriving thousands of essential healthcare,
- 409 landslides and 140 rivers burst their banks,
- Around 12,000 km of roads were damaged account for 36 per cent of Iran's national road network,
- 78 roads were blocked, 314 bridges across the

country collapsed, the reliability of 84 bridges was questioned,

- overflowing of several large dams, particularly in Khuzestan and Golestan leading to the evacuation of many villages and several cities and,
- damage to agricultural infrastructure was estimated at 2.2 billion USD (2019 USD).

Preliminary damage and loss assessments have been undertaken by the government and civil society. A more comprehensive Post Disaster Needs Assessment (PDNA) of the needs of the affected communities, and the impact the floods on key infrastructure such as public service buildings (administration, schools etc.), power lines, drinking water supply, hospital services, livelihoods, shelter etc. has been undertaken by the join team of UN agencies, as requested by the Islamic Republic of Iran.

This PDNA considers the social, economic and human impact of the floods in the two most affected districts of Lorestan and Golestan. The severe impact of the floods on the multiple development sectors is likely to have implications on Iran's efforts to achieve the 2030 agenda for sustainable development.

14.3 Economic impacts of the 2019 floods: Province Assessment, Golestan and Lorestan

Pre-disaster context

As requested by the Government of the Islamic Republic of Iran, the post disaster need assessment of the floods focused on the two most affected provinces, namely Lorestan and Golestan.

Table 1 and Table 2 show that the two provinces share similar characteristics related to area, population, unemployment rate, economic participation rate, and contribution to the national economy.

Table 1: Basic Statistics of GOLESTAN, 2016

No.	Indicator	Value	Unit
1	Land Area	20,367	Km2
2	Population	1,777,014	People
3	Share of Population	2.4	per cent
4	Population Average Annual Growth	1.9	per cent
5	Internet (per 100 people)	12.8	per cent
6	Unemployment rate	12.6	per cent
7	Economic participation rate	38.2	per cent
8	Contribution of GDP	1.37	per cent

Source: Iran Statistical Yearbook 1394, National Account, Central Statistics of Iran, 2016

Table 2: Basic Statistics of LORESTAN, 2016

No.	Indicator	Value	Unit
1	Land Area	28,294	Km2
2	Population	1,754,243	People
3	Share of Population	2.3	per cent
4	Population Average Annual Growth	0.44	per cent
5	Internet (per 100 people)	12.1	per cent
6	Unemployment rate	13.0	per cent
7	Economic participation rate	35.0	per cent
8	Contribution of GDP	1.21	per cent

Source: Iran Statistical Yearbook 1394, National Account, Central Statistics of Iran, 2016

Furthermore, from 2006 to 2014, each affected province made similar contributions to the national economy and population (**Figure 1)**.

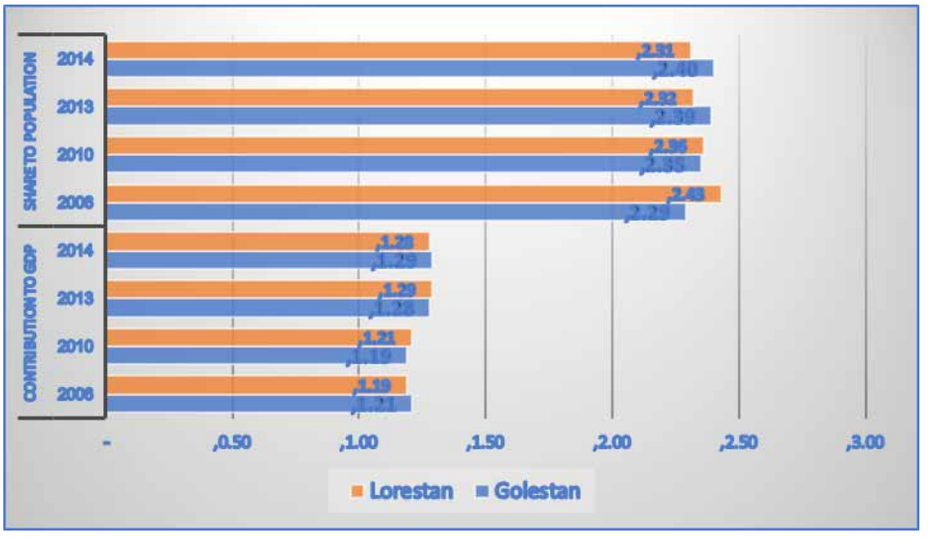


Figure 1: Contribution to GDP and Share to Population of Golestan and Lorestan, 2006-2014
Source: Iran Statistical Yearbook 1394, National Account, Central Statistics of Iran, 2014

The greatest contribution to the national economy from both provinces comes from the agriculture, livestock and forestry sectors with Lorestan contributing far more in the fisheries sector than Golestan (Figure 2).

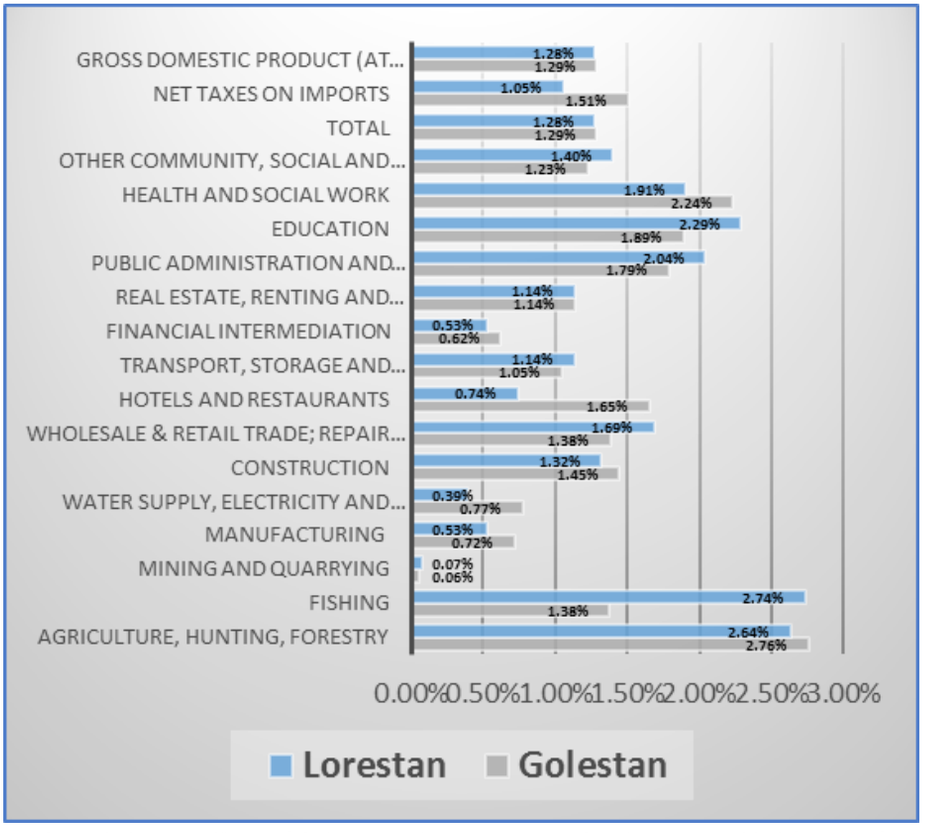


Figure 2: Sectoral Share of Golestan and Lorestan to National Economy, 2018 (per cent)
Source: Iran Statistical Yearbook 1394, National Account, Central Statistics of Iran, 2016

The 2017-2018 employment data for the two provinces (**Table 3, Figure 3 and Figure4)** show that employment indicators, including labour characteristics, in the two flood-affected provinces are relatively similar.

Table 3: Major Labor Force Indicators by Provinces for the year 2017/2018

No.	Province	Economic Participation Rate		Employment Ratio		Unemployment Rate		
		2018	2017	2018	2017	2018	Confidence 95 per cent	2017
1.	Golestan	38.3	37.8	34.6	33.2	9.8	(8.7-10.9)	12.2
2.	Lorestan	36.8	35.3	31.8	31.0	13.5	(11.8-15.2)	12.2
Total		40.5	40.1	35.6	35.3	12.0	(11.8-12.3)	11.9

Source: Central Statistics of Iran, Plan and Budget Organization (PBO), 2019

Between 2017 and 2018, the economic participation rate and the employment ratio in both provinces were in line with the increases occurring at the national level (**Table 3**). In Lorestan, the economic participation rate from 2017 to 2018 increased well above the national rate while Golestan showed a more moderate increase that was more in line with the national level. The unemployment rate is Golestan has had a significant decrease from 2017 to 2018 while there has been a slight uptick in in the unemployment rate in Lorestan.

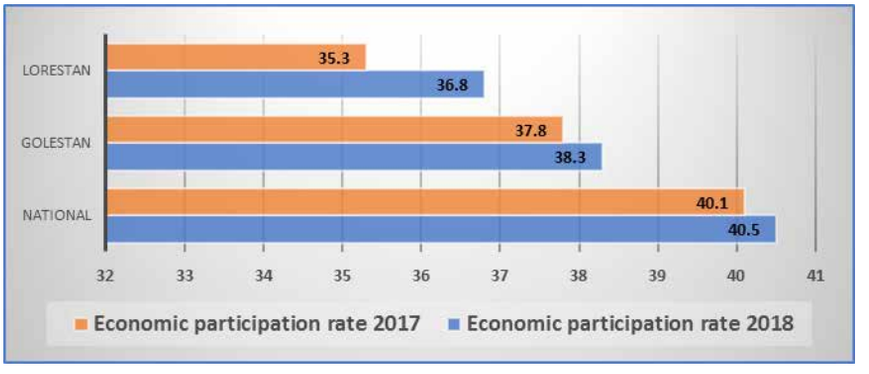


Figure 3: Economic Participation rate of Golestan, Lorestan and National, 2017-2018
Source: Central Statistics of Iran, Plan and Budget Organization (PBO), 2019

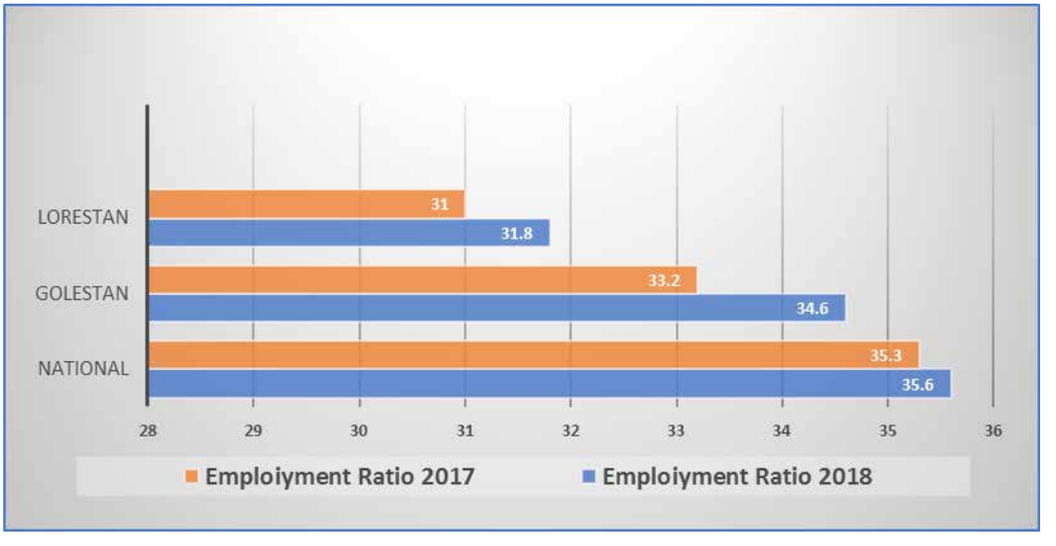


Figure 4: Employment Ratio of Golestan, Lorestan and National, 2017-2018
Source: Central Statistics of Iran, Plan and Budget Organization (PBO), 2019

Post-disaster assessment

Estimated Damages and Losses

The total cost of the 2019 floods in the two provinces was estimated at IRR 108811 billion (USD 1034 million). The economic damage (mostly to physical infrastructure and assets) amounted to IRR 86219 billion (approximately USD 822 million), while production losses (mainly from agriculture, trade, and transport services) were estimated at IRR 22592 billion (approximately USD 215 million). The summary and distribution of damage and loss estimates is given in **Table 4** and **Figure 5** which notes that damages contributed to a larger share (79 per cent) of the total cost of the floods than the estimated losses (21 per cent).

Figure 5: Cost Breakdown of the 2019 Floods in Golestan and Lorestan (per cent)
Source: Estimates based on official data from the UN Join Team of PDNA, August 2019

Table 4. Tentative Damages and Losses Assessment of the Post Floods in Golestan and Lorestan Provinces, as of 30 August 2019

No.	Sectors	Damage IRR (Billion)	Losses IRR (Billion)	Total IRR (Billion)
1	Housing	31818	-	31818
2	Education	2504	106	2610
4	Cultural Heritage and Tourism	1428	74	1502
5	Agriculture, Fisheries & Livestock	23049	16837	39886
6	Transport	11213	2536	13749
7	Water, Sanitation & Hygiene	5382	18	5400
8	Community Infrastructure	-	-	-
9	Energy (Electricity & Gas)	836	5	841
10	Employment and Livelihoods	5558	-	5558
11	DRR	2872	3015	5887
12	Environment	1559	-	1559
13	Gender and PWDs	-	-	-
Total (Billion IRR)		86219	22592	108811

Source: Tentative Estimation of UN Join Team for PDNA, August 2019

Figure 6 and Table 5 shows the sectoral and provincial estimated damage and loss for the two provinces. The PDNA estimates that the greatest damage and loss overall occurred in housing, agriculture, transport and WASH (water and sanitation) sectors. Figure 7 shows the proportion of damages and losses in Lorestan and Golestan.

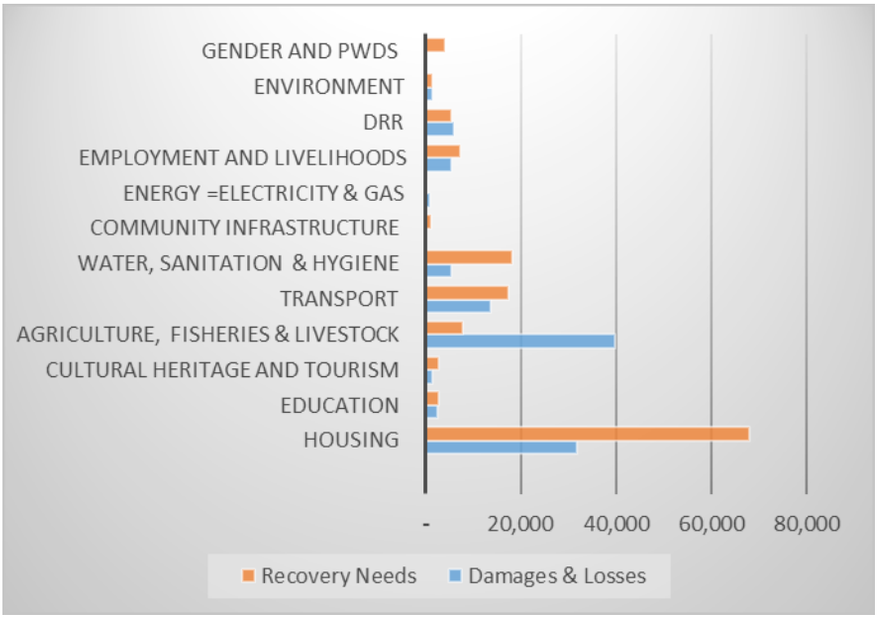


Figure 6: Sectoral Damages and Losses of the 2019 Floods in Golestan and Lorestan
Source: Estimates based on official data from the UN Join Team of PDNA, August 2019

Table 5. Distribution of Sectoral Damages and Losses between Golestan and Lorestan Provinces

No.	Sectors	Golestan (IRR Billion)	Lorestan (IRR Billion)	Total (IRR Billion)
1	Housing	11108	20710	31818
2	Education	966	1644	2610
4	Cultural Heritage and Tourism	776	725	1.502
5	Agriculture, Fisheries & Livestock	14766	25119	39886
6	Transport	3911	9837	13749
7	Water, Sanitation & Hygiene	793	4607	5400
8	Community Infrastructure			-
9	Energy =Electricity & Gas	137	704	841
10	Employment and Livelihoods	2729	2829	5558
11	DRR	2172	3715	5887
12	Environment	60	1499	1559
13	Gender and PWDs			-
Total (IRR -B)		37418	71389	108811

Source: Tentative Estimation of UN Join Team for PDNA, August 2019

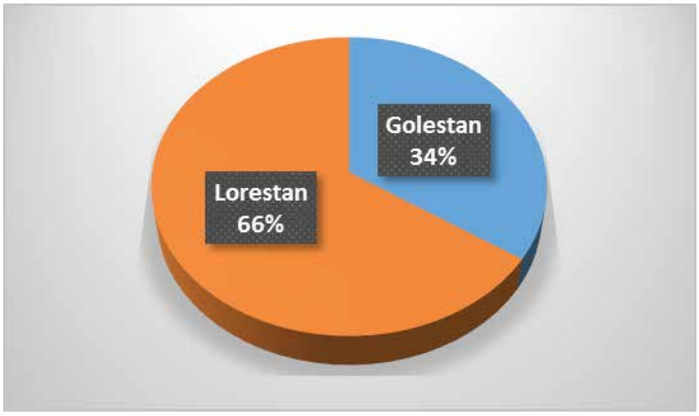


Figure 7. Distribution of Damages and Losses in the two affected provinces
Source: Tentative Estimation of UN Join Team for PDNA, August 2019

Figures 8-18 further show the estimated damage and loss comparison between the two provinces. Lorestan lost more in energy, infrastructure, disaster risk reduction (DRR), housing, environment, WASH, livelihood and transport sectors. In the energy sector the estimated value of damage and loss in Lorestan is more than 4 times greater than Golestan and in the infrastructure sector, it is almost 8 times greater. The value of the damage and loss to the DRR and housing sectors in Lorestan is almost double the estimated value in Golestan.

In the environmental sector, most of the total damage and loss was faced by Lorestan, reaching 96 per cent of the total. Comparison of damage and estimated losses from the last two sectors, WASH, and transportation show that Lorestan faced 85 and 72 per cent of the damage and loss respectively. However, Golestan faced higher damage and losses in some sectors such as education, agriculture, and culture and tourism. The estimated damage and loss in the culture and tourism sectors was similar in the two provinces (52 per cent in Golestan and 48 per cent in Lorestan).

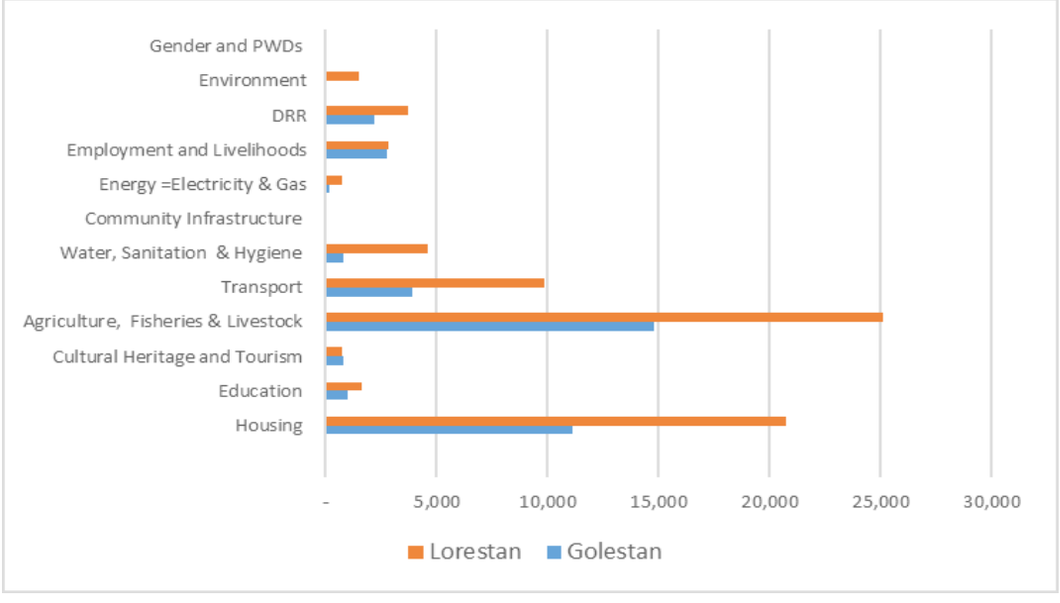


Figure 8. Distribution of Sectoral Damages and Losses in the two affected provinces
Source: Tentative Estimation of UN Join Team for PDNA, August 2019

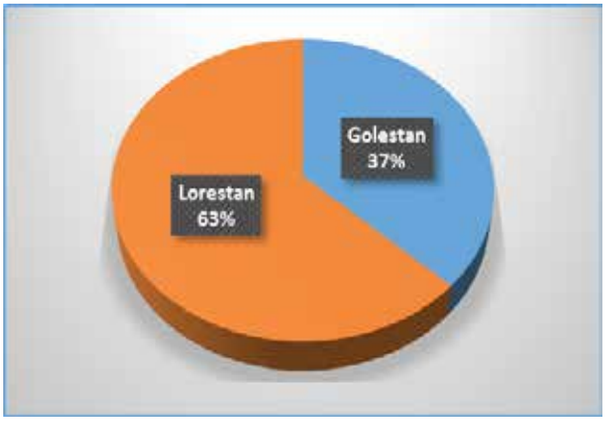


Figure 9: Damage and Loss of Education Sector

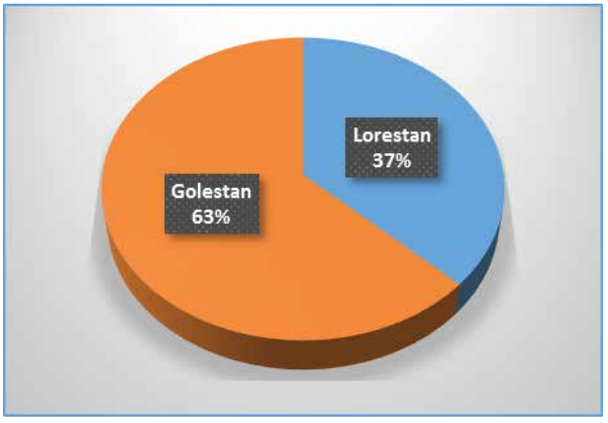


Figure10: Damage and Loss of Agriculture Sector

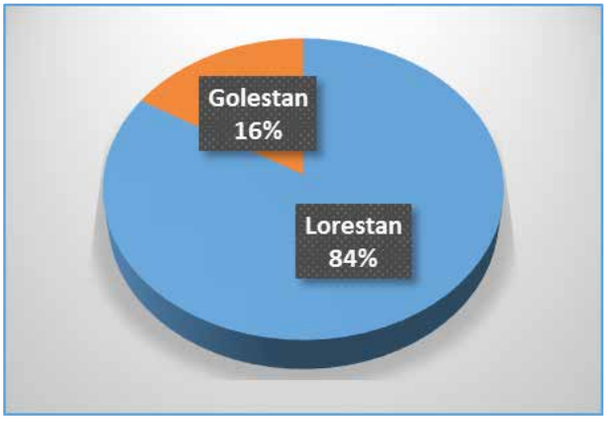


Figure 11: Damage and Loss of Energy Sector

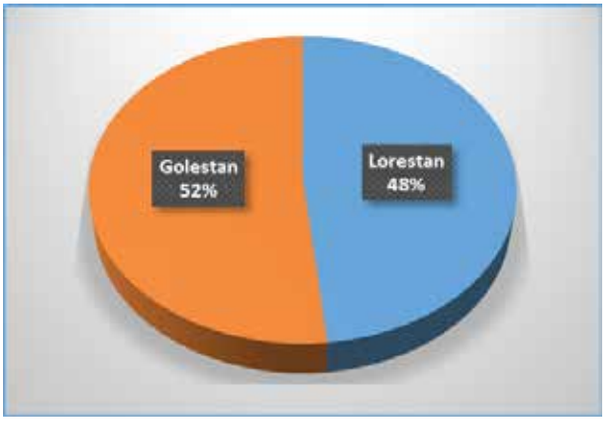


Figure 12: Damage & Loss of Culture & Tourism

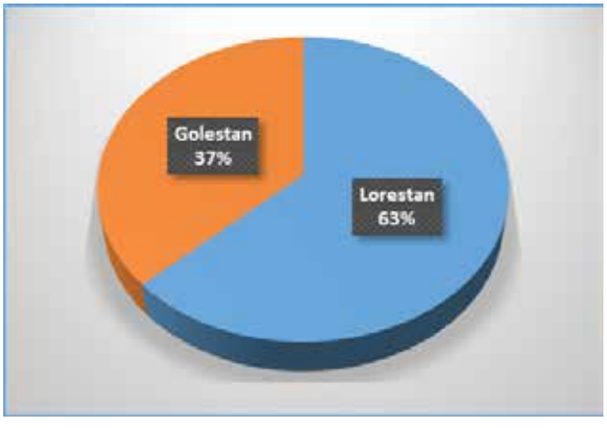


Figure 13: Damage & Loss of DRR Sector

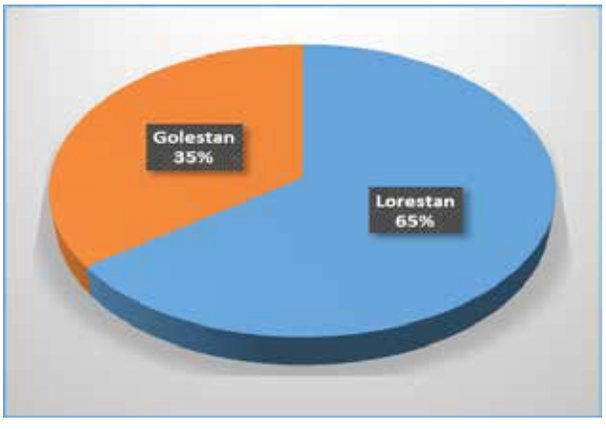


Figure 14: Damage & Loss of Housing Sector

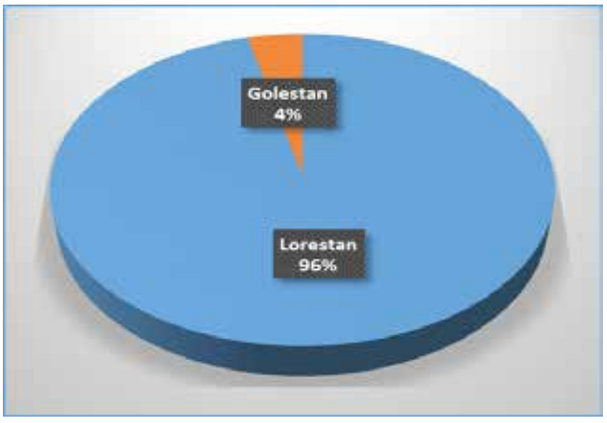


Figure 15: Damage & Loss of Environment Sector

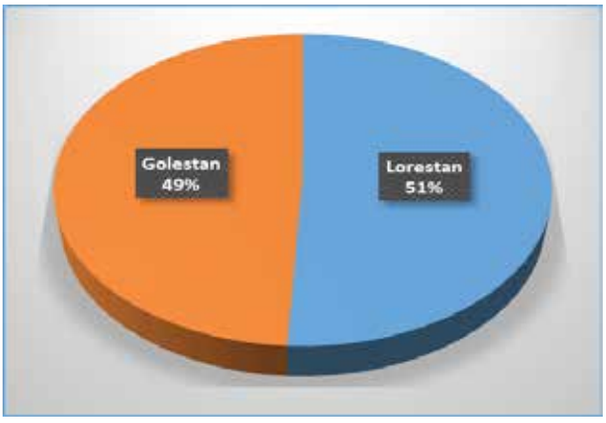


Figure 16: Damage & Loss of Livelihood Sector

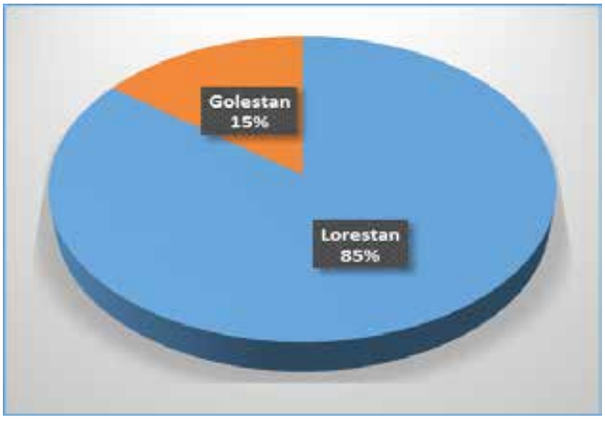


Figure 17: Damage & Loss of WASH Sector

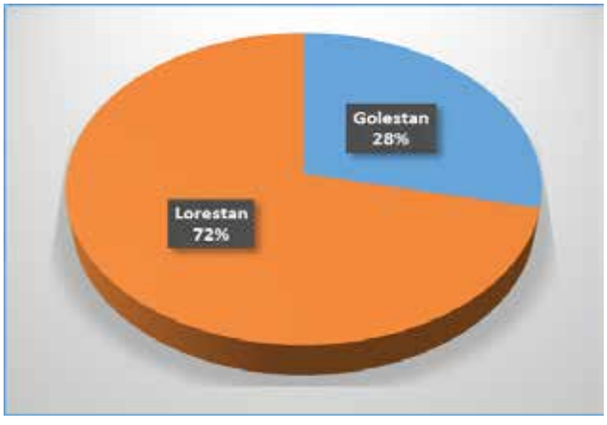


Figure 18: Damage & Loss of Transportation Sector

Impacts of the damage and loss on employment and local economy

The damage and loss in the two provinces were found to have a severe impact on the local economy. Estimates made in the livelihood and employment sector show that as many as 46735 people lost their jobs, which, added to the estimated damage to the local economy, reached a damage fee of IRR 6089 billion, as noted in **Table 6** below. The estimates show that Lorestan had the greater share of lost employment from the floods, 65 per cent as opposed to 35 per cent for Golestan (**Figure 19**).

The calculations in **Table 6** still need further clarification and careful effort is needed from the provincial government to be able to restore the local economy and livelihoods affected in both provinces.

Table 6: Impact on Local Economy and Employment in Golestan and Lorestan

Provinces	Number of damaged units	Number of lost employment	Cost of damage IRR (Billion)
Lorestan	26095	31737	2683
Golestan	2231	6296	3406
Total	28326	46735	6089

Source: Tentative Estimation of UN Join Team for PDNA, August 2019

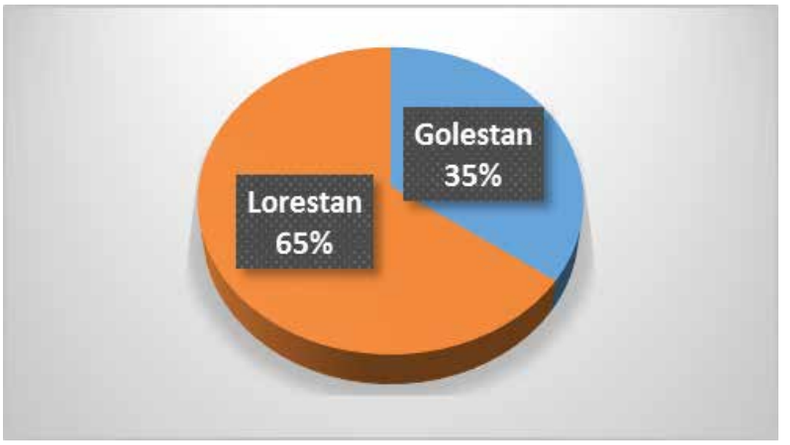


Figure 19: Distribution of number of Job Losses in the two affected provinces

Recovery Needs and Costs

The available damage and loss data note that the recovery needs are considerable; the total cost of recovery is estimated at IRR 136461 billion, or USD 1.29 billion **(Table 7**). **Table 8** and **Figure 20** provide a further detailed breakdown of the recovery timescale. The short-term recovery accounts for more than half of the recovery costs followed by the medium-term recovery which accounts for 19 per cent and finally the-long-term recovery accounting for 6 per cent.

In the short term, the housing, WASH, and Gender and PWD (people with disability), heritage/tourism, and education sectors require the most assistance and account for 89.7 per cent of the short-term recovery needs. These sectors are directly linked to the social health of affected communities and vulnerable populations.

In the medium term, employment, agriculture, and transport sectors have greater recovery needs and account for 76.4 per cent of the medium-term recovery costs. These sectors in particular are related to the economic health of the affected communities.

Finally, community infrastructure, DRR, and environment make up the predominant recovery sectors for long term recovery account for 54 per cent of the long-term recovery costs.

Table 7: Total recovery needs in Golestan and Lorestan (per August 2019)

Sectors	Damages & Losses (billion IRR)	Recovery Needs (billion IRR)
Housing	31818	67846
Education	2610	2916
Cultural Heritage and Tourism	1502	2673
Agriculture, Fisheries & Livestock	39886	7715
Transport	13749	17425
Water, Sanitation & Hygiene	5400	18211
Community Infrastructure	-	1260
Energy (Electricity & Gas)	841	163
Employment and Livelihoods	5558	7367
DRR	5887	5348
Environment	1559	1372
Gender and PWDs	-	4166
Total (billion IRR)	108811	136461

Source: Tentative Estimation of UN Join Team for PDNA, August 2019

Table 8: Recovery Needs Breakdown of the 2019 Floods in Golestan and Lorestan (billion IRR)

No.	Sectors	Recovery Needs			
		Short-term	Medium-term	Long-term	Total
1	Housing	67846	-	-	67846
2	Education	2916	-	-	2916
4	Cultural Heritage and Tourism	2390	139	144	2673
5	Agriculture, Fisheries & Livestock	1472	6243	-	7715
6	Transport	5227	8712	3485	17425
7	Water, Sanitation & Hygiene	15660	2551	-	18211
8	Community Infrastructure	385	430	445	1260
9	Energy (Electricity & Gas)	53	60	50	163
10	Employment and Livelihoods	2426	4941	-	7367
11	DRR	783	1715	2850	5348
12	Environment	113	209	1050	1372
13	Gender and PWDs	3124	1041	-	4166
Total (IRR -Billion)		102396	26041	8024	13641

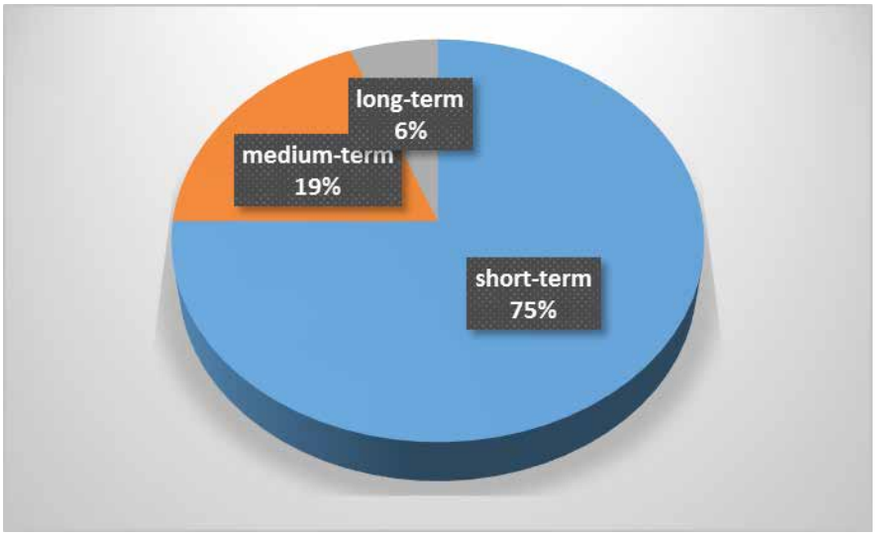


Figure 20: Recovery Cost Breakdown of the 2019 Floods in Golestan and Lorestan (per cent)

Comparing some elements of the recovery needs between the two provinces show that Lorestan has greater recovery needs, particularly in the area of community infrastructure **(Figure 21)**. In addition, the province also has slightly greater recovery needs in the gender and PWD sector **(Figure 22)**.

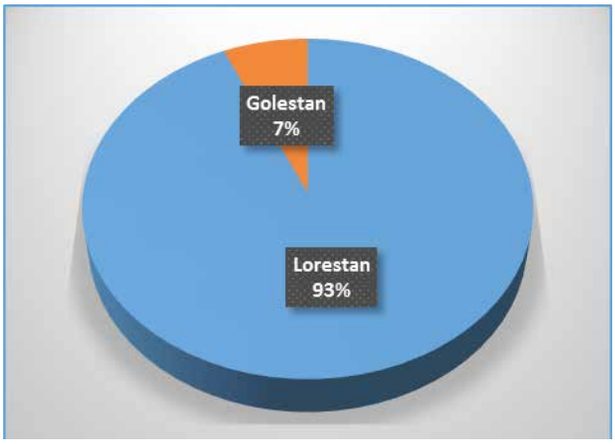


Figure 21: Recovery Needs of Community Infrastructure

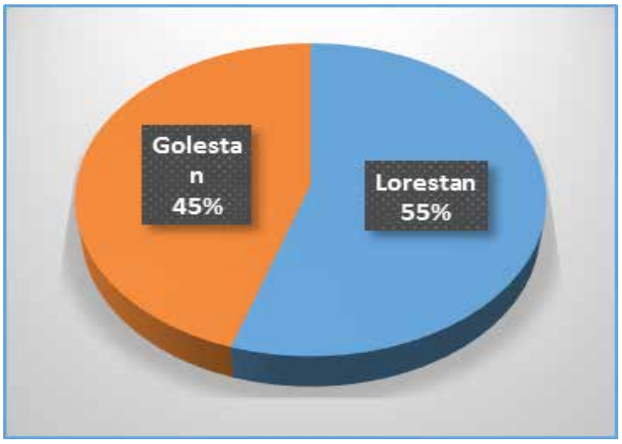


Figure 22: Recovery Needs of Gender Sector

Livelihood recovery: a look at the economic subsectors and unemployment reduction

The recovery needs for the local economy and restoration of livelihoods are tied to recovery of several economic sub-sectors including industry and mining, cooperatives, and carpet crafts. **Table 9** presents a further damage and loss breakdown of the economic sub-sectors; the overall estimates show that Lorestan requires a slightly greater recovery effort than Golestan, with a ratio of 52 per cent in Lorestan, compared to 48 per cent in Golestan.

Table 9: Financial Support for Recovery of Prominent Economic Sectors in Golestan and Lorestan

Unit	Industry and mining	Cooperative	Guild	Total *	Per Cent
Province	**IRR (Billion)**	**IRR (Billion)**	**IRR (Billion)**	**IRR (Billion)**	
Golestan	1872	101	379	2352	48%
Lorestan	391	550	1648	2589	52%
Total	2263	651	2027	4941	100%

Source: Tentative Estimation of UN Join Team for PDNA, August 2019

Furthermore, to be able to restore the local economy and in particular to reduce the unemployment rate caused by floods in the two provinces, an overall incentive program is needed amounting to IRR 2426 billion, with Lorestan receiving a larger share compared to Golestan (**Table 10**).

Table 10: Incentive program to support unemployment in Golestan and Lorestan

Province	Number of public employment jobs	Cost of Implementation of public employment USD (Million)	Number of unemployed (formal)	Unemployment Insurance Payment USD (Million)	Number of unemployed	Cost of Wage subsidy Plan USD (Million)	Number of unemployed (informal)	Cost of Unemployment Insurance Payment (Informal job) USD (Million)	Total cost (USD Million)
Golestan	4613	1.683	2100	2.09	4613	3.07	4425	1.52	8.31
Lorestan	7712	2.72	3269	3.26	7712	5.12	7880	3.65	14.76
Total	12325	4.4	5369	5.35	12325	8.19	12305	5.17	23.07

Source: Tentative Estimation of UN Join Team for PDNA, August 2019

14.4 Recommendations

While the Government of Islamic Republic of Iran continues on a path of fiscal consolidation, it is recommended that the Government reprioritize the expenditure towards the two most affected provinces. A full-scale post-disaster needs assessment that includes all affected provinces may also assist in further understanding the impacts of the floods for the national economy.

Thus, the following recommendations may be taken into consideration.

(1) Assess further impacts on the macro economy with a more comprehensive PDNA

Given that the estimation of sectoral damages and losses were limited to Golestan and Lorestan, as well as the data limitations on budget, balance of payment, taxes, prices, etc., the macro-economic impacts of the 2019 floods cannot be fully estimated at this point. A more comprehensive analysis and assessment of the loss and damage in all the provinces is required to analyze the potential increases in unemployment, poverty rates, and inflation at the national, regional, and provincial level.

As the floods also impacted numerous other provinces, the team has undertaken theoretical modeling of the macroeconomic impacts from the limited economic damage and loss data to demonstrate the process of enumerating macro-economic impacts from damage and loss data. The theoretical model and its explanations are given in **Appendix 1**.

(2) Prioritize social and economic livelihood sectors for recovery

The PDNA determined that the damage and loss in the two provinces had a severe impact on the local economies and social health of the two provinces. In the short-term, social sectors (WASH, Gender, education etc.) have been highly impacted and need immediate prioritization.

The agriculture, fisheries, and livestock sector, which is the economic and livelihood backbone of the two mostly rural provinces also requires attention in both the short term (livelihood recovery) and long term (economic recovery).

Finally, to mitigate long term and additional impacts of future disasters, community infrastructure, DRR, and environment sectors should be prioritized.

(3) The disaster risks cape is changing and intensifying throughout the Asia-Pacific region and will continue to impact Iran's peoples and economies

The recent Asia Pacific Disaster Report (APDR 2019) shows that Iran is situated in several risk hotspots with high population and economic stock exposure to multiple hazards. Impacts of natural disasters on similarly situated countries have taken a long-term toll on the countries' social and economic sectors including employment, WASH and education and a model developed in the APDR demonstrates that unmitigated disaster impacts will cause long term harm to poverty reduction in Iran. Without disaster impacts, Iran's poverty rate can be reduced by 62 per cent by 2030; however, with unmitigated disaster impacts, this number will fall to only a 43 per cent reduction.

Conducting comprehensive PDNAs with baseline data for the 2019 floods as well as other near future disasters can help build long-term policy planning to mitigate the impacts and support the resilience of peoples, livelihoods and economies.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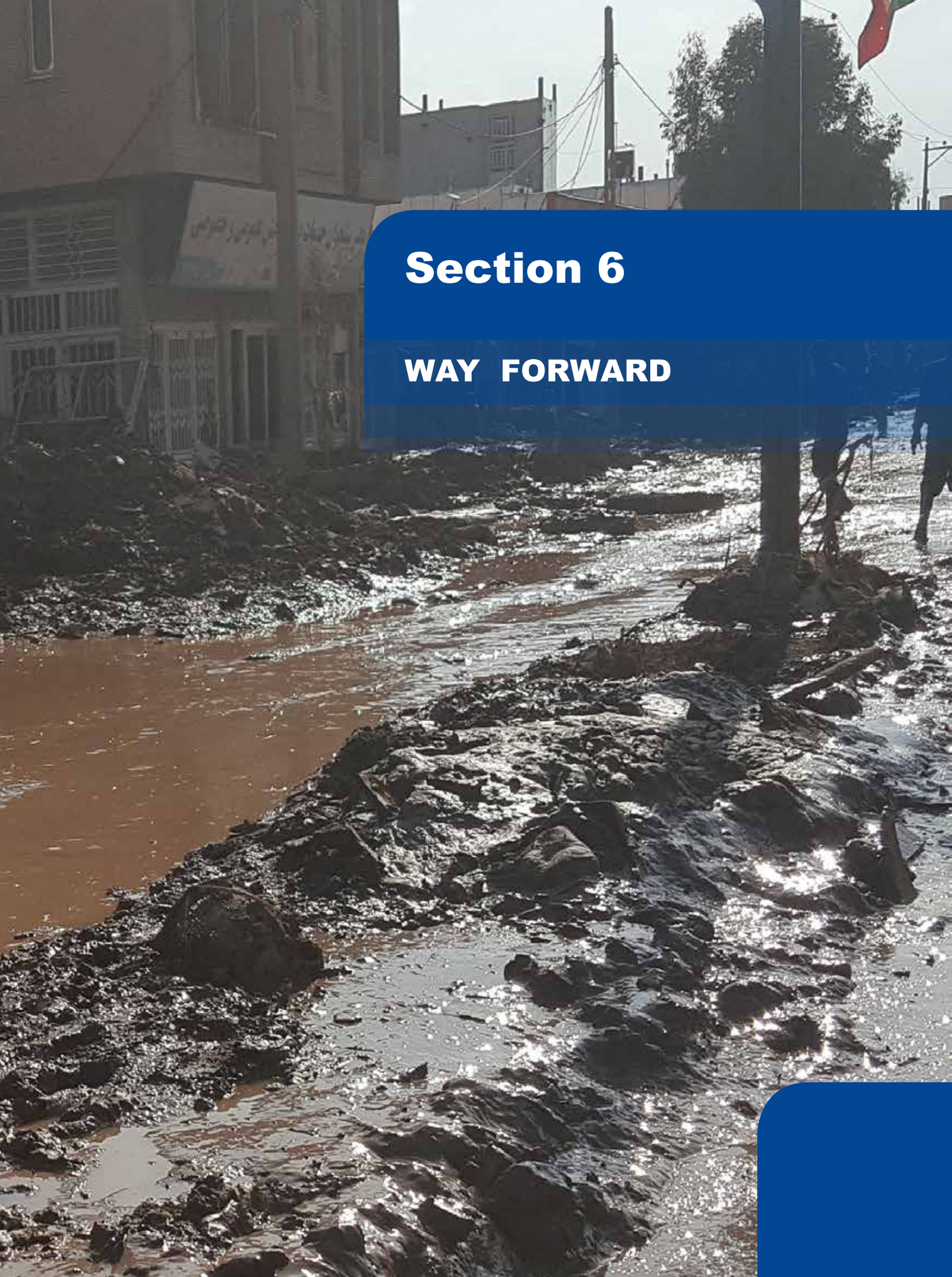


Section 6

WAY FORWARD

15. Recovery Strategy

15.1 Introduction

The widespread floods and landslides across Iran in the spring of 2019 due to unprecedented rainfall within a brief duration of three weeks was a reminder of its high level of vulnerability to climate change impacts. Unlike past disasters, the impact was far more widespread, severely affecting rural areas and all sectors of the society, economy and environment. This warranted a comprehensive and multi-sectoral approach to recovery that not only restored lives and livelihoods of those affected, but also used the floods as an opportunity to address some of the underlying risk factors and to build back better to a state of resiliency.

For a systematic approach to recovery, following the floods, the Government of Iran, through the Plan and Budget Office (PBO), collaborated with the United Nations Country Team in conducting a Post Disaster Needs Assessment (PDNA) for the provinces that were heavily damaged by the floods, namely Khuzestan, Golestan and Lorestan. Conducted for the first time in Iran, the PDNA was used to assess damage, loss and recovery needs and to develop recovery strategies for social, infrastructure and productive sectors. The economic and human impacts as well as other cross-cutting issues caused by the floods were also assessed.

The results of the PDNA captured in this report revealed that the spring floods of 2019 severely impacted the rural areas, particularly the poor. The impact at the household level was compounded by damage to houses that also acted as workspaces, loss of crops, livestock and fisheries, disruption of vital transportation links and access to markets, loss of livelihoods related to handicrafts and tourism, among others. It is therefore critical that the government along with its partners implements appropriate measures to address the social and economic effects and impacts of the floods at the household level, to facilitate their faster recovery and to avoid negative coping mechanisms that further exacerbate their state of deprivation. Equal attention should be paid to strengthening capacities at the national, provincial and local level for resilient recovery and risk-informed development.

Based on the PDNA, sector-specific recovery strategies and associated needs are elaborated in the preceding chapters. The recommended actions outlined in this chapter highlight some of the key areas that need a focused attention due to the scale and specific impact of the 2019 floods. While the damage and loss figures might be underestimated due to the limited geographical coverage, limited time frame for the assessment, and challenges related to quality and accessibility of data, the PDNA process and ensuing discussions highlighted some of the pre-existing or underlying risks that rendered people and assets vulnerable to the impacts of the disaster.

In addition to the PDNA, discussions with relevant government officials and sectoral teams provided additional inputs to this strategy. References are also made to international best practices that are applicable to the Iranian context.

The remaining sections of this chapter outline some guiding principles for the multi-sectoral recovery process, followed by strategies for the key focus areas. This is followed by a description of how the recovery strategy could be implemented through a recovery plan along with suggestions for institutional arrangements and financing options.

15.2 Proposed Guiding Principles for the 2019 Flood Recovery

As demonstrated by the PDNA results, the 2019 floods impacted all sectors – social, productive and infrastructure. Given the multi-sectoral nature of recovery, it is critical to agree on a common set of principles that all sectors would adhere to. Irrespective of the sector, aspiring for a resilient recovery process that recognizes the differential impact of the floods on the people requires that the implementation of recovery measures be guided by the following principles:[1]

- **Build back better (BBB)**. Recovery process should aim to reduce vulnerability and improve living conditions while promoting effective reconstruction. The 'build back better' approach signifies policy commitment to right-sizing, right-siting and improving the resilience of social and economic infrastructure.

1. Guide to Developing Disaster Recovery Frameworks (World Bank: 2015) provides examples of successful disaster recovery experiences from around the world.

- **Convert adversity into opportunity.** Disaster recovery can be an opportunity to rebuild/recalibrate old practices, systems and infrastructure with more affordable and resilient improvements.
- **Pro-poor recovery.** Prioritizing the needs of socio-economically vulnerable individuals and groups in recovery planning and implementation contributes to a more equitable society. If their needs are ignored, the poor and vulnerable are more susceptible to future hazards and shocks. Disaster recovery programs should include the provision of direct support to restore livelihoods and income generation opportunities.
- **Equitable and inclusive recovery through participation of vulnerable groups**: Prioritize the needs of the most vulnerable, which include poor farmers, the informally employed people, people with disabilities, women-headed households, and people in extreme poverty. Recovery interventions will, therefore, be based on equity across income levels and gender, with a specific orientation on how the flood survivors can contribute to the recovery process.
- **Equal emphasis on recovery of social and economic infrastructure**: Equal focus on the reconstruction of houses and social services like hospitals and schools, as well as vital services that will enable economic activities to recover immediately and restore and sustain the livelihoods and income of the population. This will include power, water supply, production inputs, transportation, restoring supply chains, etc.
- **Risk-informed recovery incorporating local knowledge and practices**: The reconstruction of destroyed and damaged assets will ensure that similar events will not result in the same tragedy for the people. Recovery will, therefore, be risk informed to be disaster resilient while maintaining local artisanal designs.
- **Multi-hazard resilient infrastructure**: The structural designs and location of all public and private infrastructure will take into consideration the risks not only from floods but also other hazards, making them multi-hazard resilient. Similarly, the recovery activities will ensure that environmental risks are taken into account to prevent degradation of the environment.
- **Environmentally sustainable recovery:** Use the window of opportunity presented by a disaster to reverse environmental degradation and reduce the disaster risk it poses, with specific attention to debris management, implementing environmentally sound reconstruction, promoting environmentally sustainable livelihoods and rehabilitating ecosystems. They should promote participation of local communities, while recognizing and incorporating indigenous knowledge and practice in recovery of the environment.

15.3 Priority Areas

Iran has faced multiple disasters in the past, including severe earthquakes such as the 2003 Bam earthquake and the 2017 Kermanshah earthquake. However, most disasters were limited to specific Provinces. While the country is not new to floods, the scale of impact of the 2019 floods was unprecedented in its breadth, with significant impact on the rural areas. It is critical that the recovery strategy and the recovery plan reflect the widespread, multi-sectoral and rural nature of the disaster. Therefore, in addition to the sectoral strategies and needs, this section makes additional recommendations based on insights gathered during the PDNA, contextual knowledge as well as relevant international best practices. It highlights four areas that are critical for recovery, namely, housing, infrastructure, disaster risk reduction and livelihoods (with specific attention to agriculture and integrated water basin management).

15.3.1 Resilient Housing

Given the extensive damage suffered by the housing sector, one of the key priorities of the disaster recovery activities should be housing recovery. Particular attention should be given to rural housing as 85% of the houses slated for reconstruction in the three affected provinces are rural homes.

Housing recovery should not only be equitable, inclusive and participatory, it should also promote resiliency, sustainability and environmental efficiency

while accommodating specific socio-economic and cultural context of the rural communities in the affected villages. In addition to better enforcement of regulations that restrict construction of houses on unsafe risk-prone location, given the extensive damage of rural homes, efforts should be made to develop, expand and build new rural sites according to the current social, environmental (including energy conservation and green technology) and economic needs with the provisions of multi-hazard mitigation measures.

As an urgent need, innovative approaches can be looked at to rebuild efficiently with build back better features. The reconstruction of housing may be implemented using the following mechanisms:[1]

1. *Owner-driven reconstruction*: under this mechanism, government provides financial and technical assistance to eligible homeowners (determined through objective criteria that includes income level, extent of damage suffered, type of structure, etc.). The homeowners take responsibility of reconstruction of affected houses to meet their specific needs, in accordance with the technical guidelines provided by the government. Disbursement of financial assistance by government authorities is contingent on compliance of the construction process with the technical requirements, at critical stages. This ensures that the reconstructed homes are safe and resilient to future disasters. Owner-driven reconstruction can introduce disadvantaged groups to the banking sector as the fund disbursements are made through bank transfer to the beneficiary's account. It also allows for the reconstruction funds to circulate in the local economy. In many instances, meaningful participation through the owner-driven approach unlocks financial contributions from the homeowner.

2. *Public-private partnership mechanism*: under this mechanism, the reconstruction of private housing is carried out through a partnership arrangement among government, NGOs and private partners. The agreement in the form of an Memorandum of Understanding (MoU) or other appropriate legal instrument should stipulate the percentage of the total cost of house reconstruction (including the cost of land acquisition) that will be borne by the government, NGO and/or private donor.[2] In the case of in-situ rehabilitation of flood-affected homes, partners could also agree on sharing the costs associated with both private housing and public infrastructure such as schools and health centers.

Retrofitting of homes:

Wherever applicable, retrofitting of partially damaged homes may be used as it is a cost effective approach, compared with new construction and transitional shelter. Homeowners can provide inputs on retrofitting solution, which leads to greater homeowner satisfaction, participation and livelihood recovery. Retrofitting also puts rental properties back on the market.

In addition to the above, for successful housing recovery, the following aspects require careful consideration:

- Regular and clear communication on the information on housing assistance packages to potential beneficiaries;
- Promoting an inclusive and participatory process by offering homeowners the choice for relocation or in-situ reconstruction, where applicable;
- Making multi-hazard resistant reconstruction mandatory;
- Linking payments for new construction to verification of compliance at specific construction stages to ensure multi-hazard resistant construction;
- Implementing awareness generation and confidence building measures for homeowners on safe construction using audio-visual tools including videos, folk songs, etc.;
- Ensuring design and construction quality by developing design procedures using simplified, locally applied international standards, in the absence of fully developed building codes.

1. This was adopted by the Government of Gujarat after the 2001 earthquake as well as in Haiti after the 2010 earthquake.
2. In Gujarat, NGOs assumed half of the total cost while the government contributed the other half.

15.3.2 Resilient Infrastructure

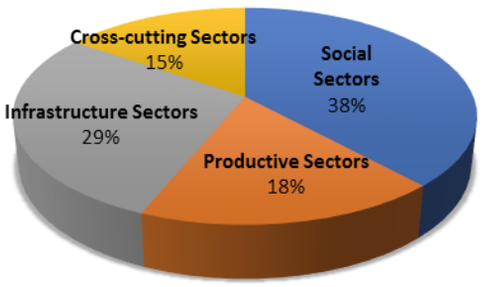


Figure: Share of Total Damage by Sector grouping

With the infrastructure sectors– Transportation, Energy (electricity and gas), Water, Sanitation and Hygiene– contributing to 29% of the total damage (IRR 36,476 Billion), building these back to resilient standards is of high priority. Along with the restoration of services in the short term, their resilience to future disasters should be built by modifying existing regulations and safety standards/codes in accordance with multi-hazard risk assessment.

All efforts must be made to avoid building critical infrastructure facilities in risk-prone areas. However, in unavoidable circumstances, suitable risk mitigation measures should be adopted. The PBO can play a significant role in ensuring this by screening the recovery projects before the funds are allocated. It is important to note that even with risk reduction and mitigation measures, the increasing intensity and frequency of hydro-meteorological events call for better preparedness of the infrastructure sectors to respond, including by having emergency plans prepared and tested prior to the disaster, backup supplies and equipment, and trained personnel. To ensure liquidity for immediate response and recovery of critical infrastructure after a disaster, comprehensive insurance coverage of all assets and installations of infrastructure is recommended.

While the infrastructure sectors mentioned above are critical for the social and economic recovery of those affected and the country as a whole, given the rural nature of this disaster, special attention needs to be given to the **restoration and rebuilding of community infrastructure**. Community infrastructure as detailed in the sector chapter are low-cost small-scale infrastructure built over time through community-led initiatives according to the social and economic needs of the community (local businesses, farmers, artisans, social groups, vulnerable segments of the population). In the flood-affected provinces, community infrastructure includes access routes to farmlands, rural roads, wells, farm drainage, small embankments and protection walls, small-scale water storage and distribution structures, handmade structures in the fish farms, traditional workshops, religious buildings and mosques, local shops and market places, community driven low-cost energy supply systems, community centers and other facilities that provide services to vulnerable groups and /or help build social networks, etc. In the absence of accurate information on the nature and extent of damage to community infrastructure in the three Provinces, the damage and loss to community infrastructure could not be estimated. Hence it is critical that a detailed assessment of critical infrastructure be conducted in the affected Provinces and revised recovery needs presented by local governments for funding.

Emphasis should be on putting in place a network of community infrastructure that links all households and segments of population to national and district level services, infrastructure, markets and social development efforts, and to create equitable opportunities for social and economic development at the community level. Because of the local nature of community infrastructure, its recovery provides the opportunity to promote appropriate technologies using local materials for flood-resistant construction and better management for their effective operation and maintenance through community engagement. However, special efforts should be made to raise local awareness and understanding of disaster resilient construction. Mechanisms need to be established to support local people (using low profit loans, technical assistance, etc.) to ensure that all communities and population groups have access to minimum infrastructure services, including disadvantaged sections and, groups with specific needs such as children and People with Disabilities, and women.

15.3.3 Building resilience through effective Disaster Risk Management

While Iran has made significant investments in the past to strengthen its early warning and emergency response capacities, these were tested by the intensity of the floods. Also, despite the advancements in

earthquake engineering and incorporation of earthquake safety features in infrastructure and social sectors, less attention has been paid to a multi-hazard approach to risk reduction that takes into account other hazards such as floods.

Building on the existing capacities in Iran, the following recommendations are made to strengthen the disaster risk management system (from preparedness to response and recovery) to enhance its resilience to future disasters as well as to promote risk-informed development:

- **Investing in weather forecasting and early warning systems**. An inventory of forecasting and early warnings systems should be undertaken along with upgrading the necessary equipment and training personnel for observing, detecting, forecasting of weather- and climate-related hazards to prevent and mitigate future disasters. Public participation in information dissemination of early warnings should be encouraged by using mobile phones, and other applications. Special attention should be given to the specific needs of vulnerable populations including women, children elderly, people with disabilities, etc.

- **Hazard Mapping and Risk Assessment**. Multi-hazard and risk maps can be generated by the scientific research centers with the support of the government. New technologies like satellite imagery and remote sensing will be vital both in hazard mapping and post-disaster assessment. These tools will also be useful in reviewing, among others, the building codes, zoning regulations and re-estimating buffer zones across bodies of water as well as landslide prone areas. They can serve as valuable tools in ensuring that investment decisions related to social, economic or infrastructure development are risk informed and appropriate steps are taken to mitigate existing risks and avoid creating new risks. However, it is important to ensure that such information is available to decision makers at the local, provincial and national level, with the right level of details that could be used to inform the decisions related to projects, programs and policies.

- **Strengthening Preparedness for Recovery.** The experience and lessons learned during the conduct of the PDNA can be institutionalized within the government. First, baseline data and information across sectors and levels of governments should be collected and be readily available in the event of a disaster. Data and information collection not only provides important information on the pre-disaster conditions including pre-existing vulnerabilities and coping capacities, but also helps establish the benchmark against which post-disaster interventions can be assessed for their effectiveness. Second, line ministries and local governments as well as other stakeholders- including academic and research institutions, private sector and civil society organizations- should be trained in the systematic assessment of damage, loss and needs as well as in the preparation of a recovery plan. The PBO can initiate discussions on how to conduct post disaster assessment and recovery in the future. Capacitating the local governments in post-disaster assessment will ease the burden of resource allocation from the national government. This can be done by developing simplified guidelines for each sector on how to conduct post-disaster assessment and recovery planning.

- **Capacity building of the government at various levels and across sectors.** Preparing for disaster recovery will require training and explaining the mechanisms that should be in place prior to a disaster including those related to legislation, policies, financial arrangements, implementation, monitoring and so on. *Preparedness for recovery* will prepare recovery schemes and approaches that can be applied effectively when a disaster occurs.

- **Setting up local community-based disaster risk management (CBDRM) organizations**. Raising disaster awareness should entail the formation of CBDRM organizations. Local governments should be encouraged to vigorously form such organizations where evacuation plans and emergency-related standard operating procedures (SOPs) can evolve. Family preparedness should be encouraged to develop a culture of safety among the population. At the beginning, this may require capacity-building both for the local governments and communities.

- **Budget allocation for emergency**. The government currently sets aside 5% of the annual budget for disaster response and another 5% for preparedness. Based on a review of funding allocation for past disasters, it may consider increasing this ceiling and also update its procedures for accessing such funds in an expedited manner, based on clear eligibility criteria for different disaster levels (that should be defined in the DM Law or DRM Policy). It is suggested that a mechanism for the allocation of funds for emergency operations to selected ministries and provincial/local governments to expedite their response in cases of disasters and emergencies may be established in the form of a National Disaster Risk Reduction and Management (DRRM) Fund. This Fund could be used to meet financing needs related to disaster preparedness, risk reduction, response and recovery, with a separate Quick Response Fund (QRF) window to be accessed by various national government agencies engaged in disaster response to meet the relief and rehabilitation needs of communities or areas affected by disasters, and financed through the national budget.[1]
- As part of the annual budgeting process, national agencies involved in disaster response maybe required to submit funding requests for the quick response window, that may be accessed in case of an emergency. To facilitate quick disbursement of funds, the use of the QRF should not require the approval of the Office of the President or any agency but should rely on certain levels of disaster effects to trigger the release of funds for emergency purposes. When the QRF is depleted, the agency may send a request for replenishment to be sourced from the National DRRM Fund for approval by the Office of the President or any appropriate authority. For accessing funds from the National DRRM Fund for early recovery interventions (damage, loss and needs assessments, recovery planning, interventions to support short and medium recovery of communities including debris clearance, shelter, livelihoods, community infrastructure, etc.), specific eligibility criteria should be established along with clear guidance to those government agencies applying for funds on the process to be followed and the minimum requirements. There should be a set of fast track procedures for administrative and financial management to facilitate efficient and quick processing of requests.
- **Mainstreaming disaster risk reduction in the planning process and investment decisions.** The government may wish to review its planning parameters to ensure that disaster risks and climate change are considered in development planning and annual budgeting processes as well as project/program approval decisions. Consistent with the Government's commitment to have a risk-informed development plan, it is important to have disaster risk reduction as one of the guiding principles in the preparation of the 7th National Development Plan, and be included in the Plan Document as a national priority and in all the sectors. This should also be reflected in the results framework of the Plan with clear targets and indicators related to disaster risk reduction, against which progress in achieving the results may be measured.
- In order to ensure that budgetary allocations and expenditures are consistent with the DRM priorities, a DRM public expenditure review may be conducted (annually as part of the budget preparations or at a different frequency) to determine how public expenditure on DRM was allocated and managed, to assess not only the impact of their investment, but also the effectiveness of budget planning and execution. Relatively, disaster concerns can be integrated in the investment decision parameters or criteria in approving public investment projects. For instance, the government of Lao PDR revised and updated their planning manuals and public investment project guides to include disaster risk reduction and climate change concerns.[2] It is intended to ensure that DRR/CCA issues are integrated and addressed in the national development planning process and sectoral plans and project proposals submitted for public investment.

1. As in the case of the Philippines.
2. This was adopted in 2015 in Lao PDR with the assistance of JICA.

15.3.4 Restoring Livelihoods while supporting agricultural recovery & integrated water basin management

Along with the reconstruction of physical infrastructure and replacement of assets, the recovery projects should aim to restore livelihoods, especially of those who are vulnerable as well as those who have lost their livelihoods due to damage to agricultural fields, livestock, loss of agricultural or handicrafts related tools/ equipment or from damage to workshops.

The flood recovery should take into account the dependence of many rural households (especially women) on both agriculture and handicrafts for their livelihoods. Therefore, livelihoods initiatives should prioritize such households who have lost both sources of income. While efforts are being made to restore agricultural fields for replanting, the use of uncultivated lands for other income-generating activities such as livestock breeding should be considered.

The early recovery processes should:

- Promote employment opportunities through building or repairing community infrastructures or flood defense systems, restoring waterbodies, water channels and rivers aiming at reducing the natural catastrophe risks in future; reconstruction of embankments; preparation of damaged and washed-away agriculture lands for replanting; land and soil restoration;
- Regenerate economic and social conditions at the heritage sites with the involvement of the local communities;
- Provide adequate distribution channels for the sale of products compiled in damaged markets;
- Prepare required skilled workers for reconstruction process by providing technical and vocational training courses;
- Develop skills of communities in line with the new technologies to create resilient community infrastructure;
- Encourage entrepreneurship in the affected areas for creating new opportunities, such as establishing permanent solid waste recycling sites which on one hand reduces the environmental impacts and on the other hand provides employment to local labor.

Given the rural and agrarian nature of the floods and the critical importance of the agriculture sector in revival of the economy and food security in the affected provinces, recovery process should also give specific attention to the following:

- Implement a **flood emergency agriculture sector safety net program** with monthly minimum income transfers to affected agriculture households based on livelihood protection thresholds to protect remaining livelihood assets, i.e. animals, equipment, land, from being sold or lost due to coping mechanisms. This could be done until the second next harvest is completed, i.e. May 2020, or even November 2020 for those who will only be able to start cropping again in the winter 2019/20 season (Ministry of Agriculture in conjunction with Ministry of Labor);
- Improve the efficiency and effectiveness of the **social protection system** by reviewing existing subsidy policy, recipient database and transfer mechanisms, and designing a shock-responsive social protection component, to be scaled up and down based on emergency or disasters needs.
- Establish an **18-month emergency credit facility**, with low to no interest for those flood affected, and investment into agriculture inputs (i.e. seed, fertilizer for the next season) or maintenance (i.e. feed and vaccinations for remaining livestock). This would enable farmers to invest in their next season, without needing to sell any assets to buy inputs;
- Establish a **Food and Nutrition Security Surveillance System (FN3S)** to monitor the evolving household and community nutrition security situation until full agriculture sector productivity is re-established, and support the government and implementing partners to prevent deterioration of the household nutrition security;
- Provide **alternative livelihoods** through the issuance of greenhouse certificate, tourism activities and cultivation of medicinal herbs to farmers whose land has been totally destroyed and is no longer usable (productive);

- Develop approaches and pilot projects for **climate – smart and disaster resilient** cereal and oilseed sector, agroforestry and reforestation, fisheries and aquaculture, horticulture sector (vegetable and orchards), livestock, etc.

Implement watershed management activities to improve integrated watershed and natural disaster risk management at the national level for the protection of the wetlands and conservation of bio diversity while building local community resilience against climate change (especially in Urmia Lake and Hoor-Al Azim and other river basins).

	Immediate Recovery Priorities for Agriculture Sub-sectors
Crops	Summer Season Seed, Winter Season Seed, recovery of soils, and reconstruction of embankments.
Horticulture	Summer vegetable seeds and cultivation recovery support.
Livestock	Emergency Feed and fodder for 6 months, reconstruction of animal facilities.
	Apiculture rehabilitation of hives and queen bee breeding, sugar feeding for summer/winter season 2019.
Aquaculture	Reconstruction of facilities, replacement of pumps and aerators, eggs, feed, resettlement of some farms and alternative livelihoods.

In order to mitigate the impacts of disasters on the agricultural sector and build resilience of farmers, various insurance options might be considered as a medium to long term strategy. A weather-based insurance system may be designed to provide insurance protection against losses in crop yield resulting from adverse weather incidences. It could be designed to provide pay out against adverse rainfall incidence (both deficit and excess) and other adverse weather incidences like frost, heat, relative humidity, un-seasonal rainfall, etc.[1] It is not yield guarantee insurance. Other options that offer insurance coverage both for borrowing and self-financed farmers with multi-risk coverage against crop loss caused by natural disasters (i.e., flood, drought, earthquake, and volcanic eruption, etc.) as well as pest infestation and plant diseases could also be considered.[2] Financial sustainability of disaster insurance solutions need to be studied in greater detail before adopting them.

Integrated water basin management approach. The severity of flood damage in Iran, partially due to inappropriate integrated water basin and upstream development, planning and management, has prompted discussion on further large-scale, engineering based dam building which require significant resources (with high capital and maintenance costs). Given Iran's natural topography (mountain ranges and river-basins in the north and west) and energy requirements, a shift to integrated policy and program approaches that include community-based approaches that are less capital intensive, which can reverse high capital-to-labor ratios and bring overhead costs down, and improve circular economy must be considered. Recovery can serve as an opportunity to adopt solutions for water management that are not only cost efficient but also resilient and sustainable, with multiple benefits to the communities. [3]

Specific attention should be given to changing general national production and consumption patterns (including for crops); improving water use efficiency; changes and refinements in crop patterns, and changes to more water efficient crops (e.g. *virtual water* calculations); investment in combined upstream-downstream natural infrastructure for retention of water, such as lakes, wetlands and forests (water holding for *long periods*); water storage dams and reservoirs;

1. India has Weather based Crop Insurance Scheme (WBCIS) which has been piloted in the country since the 2003 Kharif (monsoon) season.
2. The Philippine Crop Insurance Corporation (PCIC).
3. This could include methods that combine hard infrastructure development with local rainwater harvesting and social development instruments, including public schemes that combine engineering solutions (hard infrastructure) with support to local organizations for promoting rain-water harvesting by communities (i.e. where the rain actually falls) along with required conditional cash transfers, small grants, credits and skills training for related and necessary activities.

rainwater harvesting; underground aquifer storage and recovery activities; more efficient irrigation methods (e.g. *drip* irrigation); enhancing top soil water retention (agriculture needing less irrigation water); using saline water techniques for irrigation purposes; etc.

Such efforts should build upon the work on integrated water basin development carried out in Iran over the last twenty-five years (e.g. the MENARID project), and be complemented with advocacy and standard setting that emphasize the need to consider integrated water basin management as a key principle guiding both recovery and national development planning and investment decisions. As the custodian of technical standards/ approaches and budgetary allocations, PBO can play a critical role in establishing the enabling environment for investment in sustainable water-related infrastructure and services and to significantly raise investment levels.

To facilitate a recovery process in line with the build back better principle, PBO, as the Technical Bureau responsible for the capital-intensive infrastructure development process in Iran (through standard setting, scoring and ranking of contractors, and allocating budgets for capital investment in the public sector), should ensure **inter-sectoral budget allocation** that takes into consideration the social, economic and environmental aspects of each project proposal. For example, any allocation for building dams must be linked to upstream water harvesting measures and take into consideration the social and economic resilience of communities, among other cross-cutting themes such and livelihoods and disaster risk reduction.

To facilitate such linkages in budget allocation decisions, it is suggested that tools such as Standard Operating Procedures (SOPs), Checklists and Funding Request Templates be developed for PBO and Ministries to ensure incorporation of Build Back Better principle in recovery project proposals in key sectors, with due consideration of cross-cutting issues such as environment, gender and social inclusion, disaster risk reduction.

This should be supported by capacity building of the relevant officials in PBO, Ministries and at the provincial and local level in the use of these tools, through hands-on trainings and workshops.[1]

15.3.5 Additional Recommendations to improve Efficiency of Recovery

Considering that the recovery activities have been implemented over the past months after the floods, this might be an opportune time to assess the effectiveness of these efforts, identify specific challenges faced and take appropriate actions to rectify those. Additional actions are recommended for the Medium Term in order to improve the efficiency of the recovery efforts. Such improvements will have positive effect on the implementation of the recovery plan and hence are strongly recommended.

- **Review of existing implementation procedures and processes to expedite recovery.** Delays in the implementation of recovery projects especially those that need immediate reconstruction should be avoided. The PBO and NDMO can initiate review and discussions on the bottlenecks that cause delays to expedite the recovery process and propose correction of existing processes or new procedures and mechanisms to be developed within existing management structures.
- **Special Provisions for Emergency Procurement.** Regular procurement processes may not be fast enough if applied to post-disaster recovery. Special rules may be needed to expedite the reconstruction of vital infrastructure.[2] This could be through granting special authority to all concerned government procuring entities to procure goods and infrastructure projects, for the purpose of providing rescue, recovery, relief, and/or rehabilitation efforts for, and to continue to provide basic services to victims in areas affected by the floods below a certain threshold value established by the government and for a specific duration.[3]

1. This could be one of the areas for technical cooperation between UN/UNDP and the PBO, in promoting risk-informed recovery and development in Iran.
2. In Indonesia in the aftermath of the 2004 Indian Ocean Tsunami, the Cabinet issued a special regulation that allowed reconstruction agency BRR to appoint contractors for housing projects. It was originally valid till July 2006 but was later extended to December 2006.
3. In the Philippines, in the aftermath of typhoon Yolanda (Haiyan), after the President declared a State of National Calamity, the Government Procurement Policy Board passed Resolution No 34-2013, dated 14 November 2013

- **Establishment of a Contractor Registration and Classification System**. Individuals and firms providing specific services related to disaster response and recovery (including supply of goods, construction works, consultancy services) can be registered through a pre-qualification process. Those who meet specific criteria are ranked and their information stored in a database for easy retrieval when a need arises. If there are sufficient number of pre-approved vendors meeting the specific requirements of a project/activity, instead of going through the process of advertisement and shortlisting, the qualified candidates maybe contacted for further processing. This significantly reduces the time taken in procuring goods and services. This could be developed as a subset of the Contractor Registration system maintained by the PBO, with new fields added to include those categories relevant for disaster response and recovery.
- **Capacity building of local contractors and suppliers**. The establishment of Contractor Registration and Classification System also allows to analyze the local market conditions and map available local and national capacities to provide such services. In the aftermath of a disaster, participation of local contractors and vendors can help circulate the funds into the local economy. However, in order to ensure meaningful participation of local contractors and suppliers, additional measures should be adopted to encourage them to register, build their capacities through trainings and workshops to familiarize them with the recovery process requirements and regularly inform them of potential opportunities.
- **Expediting Transfer of Recovery Funds.** Some of the delays in implementing recovery projects may be due to cumbersome procedures associated with transfer of funds from the central authorities to local implementing agencies. It is recommended that the PBO in close cooperation with NDMO reviews the current processes (along with requirements including roles and responsibilities) for transfer of funds and adopt appropriate measures to expedite it.
- **Customs clearance.** In addition to the adjustments to the procedures for the expeditious release of humanitarian assistance from the ports or airports, similar provisions would have to be made to facilitate clearance of materials for the recovery process. Special attention may be given to facilitate emergency donations from abroad and remittances to reach the affected population during the emergency and recovery phase when they are most needed.

15.4 Implementing the Recovery Strategy

15.4.1 Recovery Plan

It is recommended that a Recovery Plan be developed, to serve as the operational framework for translating the recovery strategy into specific actions consistent with the overall vision and intended outcomes of the recovery strategy, drawing from sectoral strategies and needs and with clearly identified inputs and outputs as well as responsible entities.

The focus of the recovery plan should be on meeting the short, medium and long-term needs arising from the 2019 floods, with the objective of rapidly rehabilitating the affected assets, rebuilding people's livelihoods, especially the most vulnerable and socially disadvantaged groups, and revitalize the local economy. However, the intended outputs and outcomes of the plan should be consistent with the overall goals and objectives of the national development plan. Recovery projects, although may be a separate set of activities, must be supportive of and aligned to existing development plans (across sectors and levels of government) and must attempt to re-establish and secure previous development gains.

For the recovery of the flood-affected provinces discussed in this report, with the end of the PDNA as the zero/starting point, an overall timeframe of 5 years is envisaged, with the short, medium and long term needs having a timeframe of 0-18 months (up to 1.5 years), 18-36 months (from the 18th month to end of 3rd year) and 36-60 months (from 3rd year to end of 5th year), respectively.

The recovery plan must ensure that within its timeframe, it will build back better and bridge the gap or bring back on track the socio-economic performance of the country as envisioned in the national development plan including environmental, social and gender concerns. Occurrence of any disasters or other social/political/economic shocks during this period could have significant impact of the recovery process and might also require modification of the needs. Therefore, the recovery plan should include risk mitigation measures to minimize the negative impact of such events on the achievement of the plan's objectives and expected outcomes.

Immediate Actions Needed

To develop a recovery plan, it is recommended that the PBO (as the lead agency for recovery planning and budgeting) along with the NDMO (as the entity legally mandated to coordinate disaster recovery) initiate consultations with the ministries, local governments and with other stakeholders in order to **prioritize recovery needs and identify specific projects with funding requirements and responsible parties to achieve those needs.**

The recovery needs identified in the PDNA must be broken down into ministry-specific projects or activities with funding requirements over a given timeframe (short, medium and long-term) to indicate their level of priority or urgency. The PBO/NDMO should validate with the various ministries these priorities. Breaking down the aggregate needs into individual activities or projects will allow to:

- ***Identify the most urgent ones from the recovery needs.*** Not all of the indicated needs of each sector are urgently needed for immediate implementation. Thus, the government, through the PBO, can further evaluate and prioritize the needs of various ministries.
- ***Enable the government to analyze the potential socio-economic impacts.*** The additional costs of recovery over time and their impacts on socio-economic targets of the national development plan (like public expenditure, GDP, budget deficits, tax revenues, balance of payments, the overall public debt management as well as poverty, welfare, employment, incomes and other social indicators) can be easily analyzed if aggregate needs are broken down into specific activities.
- ***Identify funding gaps over time per sector.*** Priority needs broken down into specific projects or activities spread over time will reveal how much additional budget will be needed annually to implement them. These activities must, therefore, be detailed in terms of activities and funding requirements on an annual basis. This will help in formulating a financing strategy for recovery.

Once the initial framework for the recovery plan is developed, it is recommended that consultations be held with all relevant stakeholders across the various sectors (including development partners, civil society organizations and private sector), provincial and local governments as well as communities of the affected areas.

Based on the feedback received from the consultations, the recovery plan may be finalized with a results-based management framework, with clearly articulated monitoring and reporting mechanism as well as a communication plan. This plan and the projects contained therein will further facilitate the resource mobilization efforts as well as government's budgetary allocation decisions.

It is important to note that the geographical scope of the recovery plan, if developed based on the sectoral strategies recommended in this report, will be largely limited to the three flood-affected provinces due to the PDNA's limited coverage. Efforts to expand the scope of the specific strategies related to the sectors or the cross-cutting themes beyond the three provinces should be undertaken with caution as it might require additional data and/or analysis to validate the relevance of the specific actions for the other provinces. However, other recommendations contained in the wider recovery strategy outlined in this chapter would have broader scope beyond the three affected areas.

15.4.2 Institutional Arrangements for Recovery

In order to facilitate the development of the Recovery Plan and its efficient and effective implementation, it is recommended that the PBO/NDMO initiates immediate discussions and consultations with other ministries regarding their roles and responsibilities in developing a recovery action plan and its implementation. The following three options may be considered in developing and implementing the recovery plan.[1]

1. Handbook for Disaster Recovery Practitioners (Asian Disaster Preparedness Centre, 2015)

Option 1: The existing planning agency (or the PBO) acts as the lead agency who oversees the development of the plan, coordinates and monitors the implementation of its activities. This option has an inherent advantage because of the PBO's knowledge of: a) the planning objectives; b) the approval procedures and processes; and c) has existing coordination mechanisms with other agencies necessary for the implementation of the recovery plan. Some setbacks of this model will include: a) the recovery activities will be an added work to the planning agency, making the it a less priority task; and b) some specific skills needed may not be available at the planning agency.

Option 2: Create a new agency specifically mandated for the recovery activities.[1] While the NDMO has the responsibility under the DM Law to advance recovery in the country, its broad mandate which covers all aspects of DRM from preparedness to response and risk reduction might not allow it to dedicate resources required to undertake the extensive coordination, technical support and continuous monitoring warranted by the recovery process. However, it is critical that the NDMO along with the PBO performs an oversight role, regularly monitoring the activities of the agency, supported by a clearly established reporting system. The advantages of a new agency are: a) they have the mandate from the highest authority; b) they can be staffed with the appropriate expertise needed focusing only on the implementation; c) depending on the level of autonomy granted to the agency, they can implement recovery projects faster using their own financial management tools and processes that are not tied to bureaucratic processes of government approval. The drawbacks of this model are that such an agency might lead to duplication of government's functions and systems; might have high operating costs; might deprive government of the opportunity to build capacities of existing systems and public officials in recovery implementation. In certain cases, it might become difficult to terminate the life of this agency even after the recovery activities are implemented.

Option 3: Establish a time-bound Task Force or Committee that is mandated to plan, supervise and monitor the implementation of the recovery activities.[2] Such a temporary body with a specific mandate and definite lifespan could have the autonomy, decision making authority and technical competence necessary for the effective and efficient performance of its recovery functions.

Government Coordination and Monitoring of Recovery

Irrespective of the specific option adopted for the coordination and monitoring of the implementation of recovery plan projects, it is critical for the recovery process to be owned and led by the Government. To ensure this, development of the Recovery Plan should be led by the Government – PBO in conjunction with the Ministries with support from the NDMO, UN agencies and other partners. Both PBO and NDMO should strive for a decentralized approach for the implementation of the recovery plan, through its provincial and local offices., where the coordination at the national level is complemented by similar structures at the provincial and local levels. Necessary technical and financial support should be provided to these sub-national entities to perform their recovery-related responsibilities effectively and thereby build their capacities to manage recovery initiatives in the future.

Beyond the specific set of projects in the recovery plan implemented by the executing agency (chosen from the different options mentioned earlier), there might be other recovery projects and initiatives implemented by the line ministries/provincial/local governments that are not included in the Recovery Plan.

The coordination role of the Government is also critical to avoid any duplication of efforts as well as to ensure that the funding needs of recovery projects are adequately reflected in the annual budgetary processes.

1. This option was adopted in Indonesia after the 2004 tsunami, Gujarat, India after 2001 earthquake and in Nepal for the 2014 earthquake re-construction and in the British Virgin Islands and Dominica after the Hurricanes Irma and Maria in 2017.
2. This option was adopted in the Philippines after the super typhoon Haiyan in 2013 and in Mozambique in 2019; The Government of Mozambique created "The Cabinet for the Reconstruction of Post Cyclone IDAI" by Decree 26/2019 on April 11, 2019.

In addition to monitoring the implementation of the Plan projects, Government will have an important role in establishing the enabling environment for the effective implementation of the recovery projects. This could be related to development of new laws/regulations/policies or modifications to the existing ones as recommended in the sector-specific strategies to build back better. In order to perform this role effectively, it is critical that the government (through the coordination structure at national, provincial and local level) at all times has a clear picture of the status of recovery projects.

Given the criticality of this coordination and monitoring role, it is recommended that a dedicated team for central coordination and monitoring of recovery activities should be established. This could be in the form of a committee composed of representatives from PBO and NDMO, Line Ministries and Provincial Governments; supported by a small secretariat composed of technical staff from PBO and NDMO, Line ministries. The Committee would interface on a regular basis with representatives from other partner agencies, private sector and civil society organizations in ensuring effective and efficient implementation of the recovery.

15.4.3 Financing Options for Recovery

In order to meet the financing needs of the Recovery Plan, it is recommended that the government considers a range of options including internal revenues, loans and grants.

As an immediate measure, the government (the PBO) can develop a financing plan or strategy to accommodate the additional budgetary requirements for recovery once the annual expenditure requirements for recovery are finalized.

Depending purely on internal revenues, certain options may be considered:

- **National budget realignment.** Budgets for future national projects can be shifted for urgent repairs and rehabilitation of priority infrastructure. In doing so, the government must examine which projects can be delayed in favor of new urgent recovery activities, and be aware of the potential implications to the national development.
- **Additional fees or taxation.** Added fees or tax on certain items may be levied to finance related needs. For instance, fees from tourist sites may be increased to meet the cost of simple repairs. Airports or railways can take on added fees to finance repairs or even the upgrading weather forecasting. Taxing other non-essential products can also generate some amount to fund the recovery.
- **Review of existing subsidies**. The government can review existing subsidies which can be realigned and focused to temporarily finance recovery needs, especially those of the poor.
- **Public-private sector financing**. While the short time-frame for repairs and reconstruction of major infrastructure, their partial damage, their location in rural and remote areas (which do not yield commercial value) might not render public-private partnerships (PPP) viable, the PBO can explore collaboration with the private sector for the longer term resilient upgradation of the damaged infrastructure through PPP options such as build-operate-transfer (BOT) schemes. Such options require careful development of the commercial terms as well as an enabling environment for the PPP in the form of a new/modification of an existing law or policy, which typically takes time and therefore difficult to be put together for urgent repairs of major infrastructure in the immediate aftermath of a disaster.[1] Beyond recovery, NDMO and PBO should consider having a systematic engagement with the private sector in Disaster Risk Reduction activities (as part of risk-informed development), which could also be leveraged during post-disaster recovery. Such an engagement has to be supported by an institutional and legal framework and an action plan.[2]

1. In the Philippines, the National Resilience Council (a group composed of big companies has an agreement for cooperation with the national and /somelocalgovernments.See:https://www.smsupermalls.com/post/public-private-partnership-agreements-signed-for-phl-disaster-resiliency
For example, in Japan after the 2011, the Great East Japan Earthquake and Tsunami, private consortium signed a 30-year concession to operate the Sendai airport, where the government facilitated the private operator to: assume less uncertainty in disaster risk management (DRM) responsibilities, consider DRM measures during the planning phase, and implement prompt emergency responses at the time of disaster. For details see: https://blogs.worldbank.org/ppps/learning-japan-ppps-infrastructure-resilience.
2. See publication titled “The Development of a Public Partnership Framework and Action Plan for Disaster Risk Reduction (DRR) In Asia” for examples of private sector engagement in DRR in Asia, including legal and institutional framework and suggestions for strengthening private sector partnerships.

- **Tax breaks for affected households and businesses.** To assist households in rebuilding their damaged dwellings, certain measures can be provided by the government like limited suspension of paying real property taxes and exemption from paying building permits. The same can be extended to businesses especially those that employ a greater number of people. Aside from real property taxes, they can be extended deferred payment of income taxes or duty-free importation of production inputs, machineries and equipment.

In addition to the above, the PBO could look at other potential sources of funding including grants and loans from bilateral donors, regional development banks, development partners, private sector, etc.

It is recommended / that a **Resource Mobilization strategy** be developed aimed at for those areas within the recovery plan where funding gaps exist.

In deciding the appropriate funding source for the projects, careful attention maybe paid to the specific nature of the project and any potential return on investment from those. For example, projects in the social sector with direct human impact (reconstruction of houses, community facilities, schools, health facilities, etc., supply of tools and agriculture inputs), might be able to generate interest from potential donors and the gaps could be filled through budgetary allocations.

Meanwhile, in the case of large infrastructure projects, that have the possibility of generating return on investments, a combination of loans at favorable terms and grants/ technical assistance (from development partners or other technical agencies) could be considered. Given the significant role that infrastructure recovery plays in supporting social and economic recovery, the quick injection of funds in rebuilding key infrastructure through borrowing will facilitate faster overall economic recovery.

In addition to the government funds and new loans and grants, discussions could also be held with development partners and private sector donors currently supporting/ implementing projects to explore the option of either reallocating existing funds to meet the recovery needs or allocating additional funds to augment the existing initiatives to render them resilient.

There have been ongoing efforts globally to better utilize Islamic Social Finance, led by *Zakat*, as an alternative source of financing for humanitarian action. *Zakat*, the mandatory Muslim practice of giving a percentage of one's accumulated wealth for charitable purposes every year, is one of the main tools of Islamic social financing. It is explicitly intended to reduce inequality and is widely used in Muslim countries to fund domestic development and poverty-reduction efforts. The opportunity of channeling this for recovery of the flood-affected households as well as for future disasters maybe explored.

Disaster Risk Finance and Insurance (DRFi) schemes. As a medium-term measure, it is suggested that a study be undertaken to explore the feasibility of risk transfer mechanisms to offset the negative impacts of disasters from specific natural hazards. These mechanisms could be used to provide immediate liquidity in the aftermath of a disaster or to mitigate the negative impact of crop failure from disasters or to replace/repair/rebuild public and private assets damaged or lost in a disaster.

Subscription to catastrophe risk insurance schemes has provided countries with immediate liquidity following a disaster to meet its emergency needs as well as to ensure uninterrupted functioning of the government. Though not a direct input to the recovery plan, given the multi-year timeframe of the Recovery Plan, in the event of a disaster during its implementation period, availability of emergency response funds from the payout allows to minimize the potential risk of the funds earmarked for recovery from being reallocated to meet emergency needs. Also, payout from other insurance schemes related to public or private infrastructure or other assets can be an important funding source for recovery. However, the availability of such schemes to Iran requires further exploration.

15.5 Conclusion

Despite the unprecedented nature of the disaster and its impact, it is noteworthy that the Government of Iran was quick in responding to the needs of the survivors of the 2019 floods nationwide. Efforts are underway in reconstructing vital infrastructure and rebuilding homes and livelihoods. However, this report has noted some challenges which should be addressed for future efficiency in dealing with similar events.

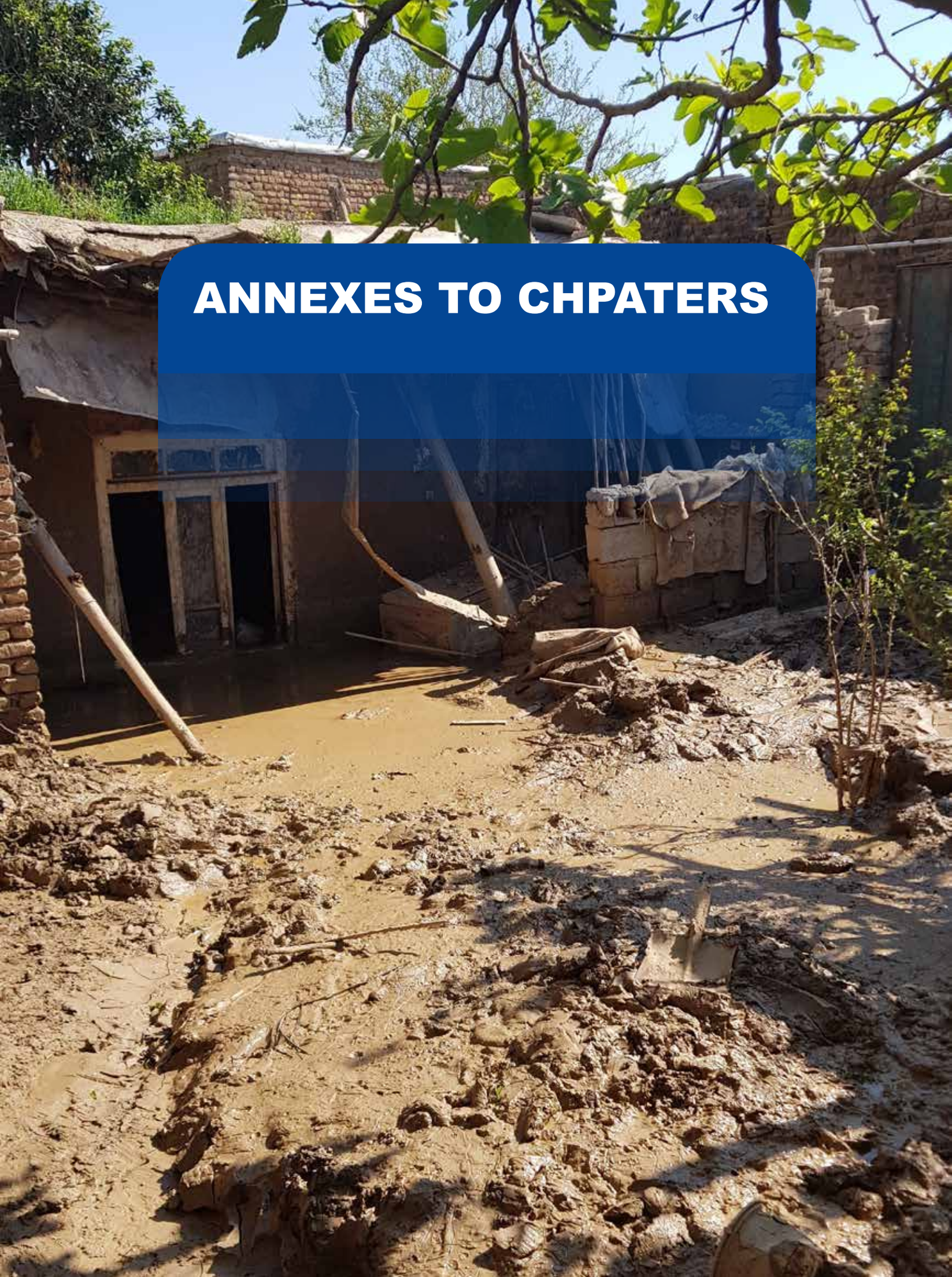
The PDNA as a process has been used in Iran for the first time and the report has generated a lot of information that is useful not just for the current post-flood recovery but to build resilience against future disasters. The recommended actions stated in the recovery strategy along with sectoral and cross-cutting theme strategies can form the building blocks of a systematic recovery effort while laying the foundation for resilient and risk-informed long-term development of the flood-affected areas. There are several long-term recovery needs identified which are linked to the long-term sustainable development. Therefore, it is critical that these are included in the national development planning process (for the 7th Five Year Plan period) and are also reflected in the future annual budgeting processes.

For successful implementation of these efforts, it is important that the PDNA and its related recommended actions becomes a government owned and government led process, using a consultative and partnership-based approach involving all relevant actors within the government across ministries as well as national, provincial and local governments, development partners, private sector, diaspora, civil society organizations and local community groups.

References

1. Handbook for Disaster Recovery Practitioners (Asian Disaster Preparedness Centre, 2015)
2. Homeowner-Driven Housing Reconstruction and Retrofitting in Haiti, 4 Years After the Earthquake, Build Change, 2014
3. ASEAN Disaster Recovery Reference Guide (2016)

ANNEXES TO CHPATERS



Annexes to Chapters

Chapter 2: HOUSING

ANNEX I – Data Collection Forms

In order to be able to collect actual damage data concerning housing in a systematic manner, a relatively concise form has been designed to be disseminated to the adequate authorities and personnel for the purpose of field data collection or alternatively sorting out and summarizing existing data sets accordingly and implanting the data sets into a structured database. Table a shows the aforementioned form.

Table I-1 – Housing and population form

Date completed	Organization (collecting Information)	Name of person (filling the form)	Contact number		Total estimated monetary loss (IRR)						
General Situation											
Census Zone (Iran Statistics Center) 2016	Geographical coordinates (Lon/Lat)	Province	County	Division	Rural Area	Village	Total population	Number of households	Number of death	Number of severely injured people	People needing temporary shelters
General Housing Information											
Total buildings (residential /non-residential)	Total housing buildings (entire individual building)	Total non-apartment housing units (single family houses…)	Total apartment housing units	other housing types (tents, slum, …)	Number of relocated with complete to severe damage to house	Number of permanently elocate people	Number of rental units	Number of units with other ownerships (gratuite, public,…)			
General Damage Data by Building Type											
Building Typology	Total damaged area (complete damage needing relocation) (m²)	Total monetary loss (complete damage needing relocation) (IRR)	Total damaged area (complete damage) (m²)	Total monetary loss (complete damage) (IRR)	Number of severely to complete damages to buildings (needing repair)	Total area of severely to complete damages to buildings (needing repair) (m²)	Total repair cost of severely to complete damages to buildings (needing repair) (IRR)	Total area of slight to moderate damages to buildings (needing repair) (m²)	Total repair cost of slight to moderate damages to buildings (needing repair) (IRR)	Total volume of debris (needing public management) (m³)	Recyclable debris total volume (m³)
Adobe											
Masonry											
Concrete											
Steel											
Others											

ANNEX II – Additional Tables

Table II-1-Housing Building typology in Affected Counties

Province	City	Steel	Concrete	Masonry	Unknown	Total
Golestan	Gomishan	9	1466	12274	19	13768
	Aq Qala	196	3748	2374	77	6395
	Gorgan	13133	40141	73415	2822	129511
	Bandar-e-Gaz	1052	1886	9761	49	12748
	Ramian	570	1935	17773	68	20346
	Gonbad Kavus	1926	15027	58047	237	75237
	Galikosh	349	3396	10700	142	14587
	Kordkuy	1822	3848	14102	64	19836
	Ali Abad	4467	5087	24638	206	34398
	Kalaleh	504	4685	19233	110	24532
	Minudasht	545	5007	13191	70	18813
	Maraveh Tappeh	18	1920	9447	10	11395
	Bandar-e-Torkaman	95	3714	13043	70	16922
	Azadshahr	1095	3476	17863	77	22511
	Total	25781	95336	295861	4021	420999
	Percentage	6.10%	22.60%	70.35%	0.95%	
Province	**City**	**Steel**	**Concrete**	**Masonry**	**Unknown**	**Total**
Lorestan	Pol-e Dokhtat	3831	79	3710	39	7659
	Borujerd	34142	1390	34188	857	70577
	Khorramabad	35257	2182	52273	668	90380
	Rumeshkan	258	12	461	4	735
	Selseleh	4301	11	3483	58	7853
	Delfan	6902	667	5918	166	13653
	Kuhdasht	8080	522	15488	164	24254
	Aligudarz	7746	447	14698	93	22984
	Dorood	12601	2438	11160	240	26439
	Doreh	270	13	474	5	762
	Azna	4916	194	6155	65	11330
	Total	118304	7955	148008	2359	276626
	Percentage	42.70%	2.80%	53.65%	0.85%	

Province	City	Steel	Concrete	Masonry	Unknown	Total
Khuzestan	Ahvaz	64693	50679	197688	3423	316483
	Shadegan	1693	2425	21098	350	25566
	Dasht-e-Azadegan	308	271	15447	278	16304
	Shush	1717	3997	30719	281	36714
	Shushtar	2320	8027	28610	263	39220
	Dezful	5636	10065	75564	641	91906
	Izeh	2662	11287	26243	182	40374
	Korramshahr	5160	3155	25519	393	34227
	Hoveyzeh	5	13	5343	99	5460
	Total	84194	89919	426231	5910	606254
	Percentage	13.80%	14.95%	70.30%	0.95%	

Table II-2-Number of fully and partially damaged buildings in Lorestan Province based on data provided by Housing Foundation (early estimation)

County	Fully Damaged		Partially Damaged	
	Urban	Rural	Urban	Rural
Pol-e Dokhtar	337	659	1573	135
Aligudarz	182	1906	78	212
Borujerd	31	481	25	134
Khoram Abad	280	1256	661	1008
Romeshkan	30	301	9	159
Selseleh	5	846	6	1049
Delfan	82	2554	735	1485
KuhDasht	177	2084	271	181
Doreh	5	667	161	198
Azna	1	230	12	564
Dorud	21	218	437	1167
Total	1151	11202	3068	6292

Table II-3- Number of fully and partially damaged buildings in Golestan Province based on Housing Foundation data (early estimation)

County	Total	Fully damaged	Partially Damaged
MaravehTapeh	722	492	230
Kalaleh	318	173	145
Galikosh	524	96	428
Minudasht	630	84	546
Gonbad	2,404	532	1,872
Azad Shahr	449	134	315
Ramian	475	119	356
Ali Abad	565	103	462
Gorgan	753	123	631
AqQala	2,250	350	1,900
Gomishan	701	180	521
Bandar Torkaman	335	190	145
KordKuy	439	172	267
Bandar Gaz	264	75	189
Total	10,829	2,822	8,007

ANNEX III – Approved ongoing construction and proposed methods

Ongoing types with considerable amount of labor work at the sites are generally confined masonry and bolt and nut steel frame with masonry infill walls.

Confined masonry

Bolt and nut steel frames (steel frames are factory made)

However different more advanced methods for construction and presented as:

- 3D wall panes
- ICF (Insulated Concrete Frame) system
- Precast concrete modular units
- LSF (Light Steel Frame) system

Light Steel Frame – LSF (factory made elements but labor intensive at the site)

Precast concrete box system (factory made and minimal work at the site with less flexibility for architectural design)

ICF (Insulated Concrete Frame) method

Light Steel Frame – LSF (factory made elements but labor intensive at the site)

3D panel system

Chapter 6: AGRICULTURE, FiSHERIES AND LIVESTOCK

Annex I

Measuring the land area of flood-affected agriculture fields through the use of remote sensing pictures of satellites (Iranian Space Agency)

Table 24: County level agri-fields flood inundated areas report for Golestan province, Iran

Province	County	All Inundated Fields (ha)	Green Inundated Fields (ha)	Tree Plantation Inundated
Golestan	Aliabad	66.15	44.93	0
	Azadshahr	81.55	4.05	0
	Gorgan	502.45	266.64	1.02
	Kordkuy	1104.28	971.93	17.62
	Torkman	4538.27	3964.75	2.93
	Ramiyan	37.3	35.99	0.36
	Bandar-e Gaz	190.69	69.41	3.86
	Kalaleh	52.03	39.23	0.44
	Gonbad	639.48	431.13	5.71
	Aqqala	2720.91	2538.08	6.2
	Minu Dasht	16.24	14.91	0.85
Total Area (ha)		9949.35	8381.05	38.99

Table 25: County level agri-fields flood inundated areas report for Lorestan province, Iran

Province	County	All Inundated Fields (ha)	Green Inundated Fields (ha)
Lorestan	Azna	65	10
	Aligudarz	363	231
	Borujerd	1709	507
	Poldokhtar	5622	4878
	Khorramabad	4954	2683
	Delfan	797	179
	Dorud	3366	422
	Selseleh	696	286
	Kuhdasht	4750	4168
Total Area (ha)		22322	13363

Table 26: Summary of immediate (12 months) recovery needs in the agriculture sector (country level)			
Sub-sector	**Recovery Priorities**	**Needs (Billion IRR)**	**Needs (Million USD)**
Crops	Summer Season Seed, Winter Season Seed, recovery of soils, and reconstruction of embankments.	N/A	N/A
Horticulture	Summer vegetable seeds and cultivation recovery support.	N/A	N/A
Livestock	Emergency Feed and fodder for 6 months, reconstruction of animal facilities.	N/A	N/A
	Apiculture rehabilitation of hives and queen bee breeding, sugar feeding for summer/winter season 2019.	N/A	N/A
Aquaculture	Reconstruction of facilities, replacement of pumps and aerators, eggs, feed, resettlement of some farms and alternative livelihoods.	N/A	N/A
Irrigation	Pumps and recovery support for irrigation facilities.	N/A	N/A
Agriculture Emergency Safety Net	Transfers to the most vulnerable affected subsistence farmers, seasonal and permanent labourers, for 100,000HH for the first 12 months.	9600	91.2
Iran Agriculture Insurance Fund	Loans for damage compensation, at flexible terms and low interest rates.	60	0.57
Emergency Soil and Water Assessment	Urgent emergency soil and water assessments in Lorestan, Golestan and Khouzestan, to establish changes to soil and solutions to current challenges.	4	0.038
Food and Nutrition Security Surveillance System	Households and community nutrition security situation monitoring through a sentinel site system until full productivity is established, covering at least the 3 provinces for 18 months.	212	2.01
Crop and Food Security Assessment Mission	Detailed crop and food security assessment assessing the next winter harvest in April/May 2020, in all affected provinces.	24	0.23
GRAND TOTAL		**9900**	**94.1**

Table 27: Summary of medium to long-term needs (13-48 months) in the agriculture sector (country level)

Sub-sector	Recovery Priorities	Needs (Billion IRR)	Needs (Million USD)
Agriculture Emergency Safety Net	Provide transfers to the most vulnerable affected subsistence farmers, seasonal and permanent labourers, for 50,000HH remaining 6 months until full production cycle is recovered.	2400	22.8
Land and Soil	Land and soil restoration in other provinces, based on emergency soil assessment.	N/A	N/A
Watershed management	Watershed management activities to improve integrated watershed and natural disaster risk management on national level.	775	7.4
Climate Change Adaptation and Resilience Building	Develop approaches and pilot projects for climate – smart and disaster resilient cereal and oilseed sector.	147	1.4
	Develop approaches and pilot projects for climate - smart and disaster resilient agroforestry and reforestation.	294	2.8
	Develop approaches and pilot projects for climate – smart and disaster resilient fisheries and aquaculture sector.	147	1.4
	Develop approaches and pilot projects for climate – smart and disaster resilient horticulture sector (vegetable and orchards).	147	1.4
	Develop approaches and pilot projects for climate – smart and disaster resilient livestock sector.	147	1.4
	Develop approaches and pilot projects for Hoor-Al Azim Wetlands – Protecting wetland biodiversity for increased disaster resilience to climate change	139	1.3
Social Protection	Review existing subsidy policy, recipient database and transfer mechanisms to increase efficiency and effectiveness of the social protection system.	N/A	N/A
	Design a shock-responsive social protection component, to be scaled up and down based on emergency or disasters needs.	N/A	N/A
Disaster Risk Reduction and Management	Joint UN/Gov mission to assess capacity for disasters risk reduction.	3	0.003
	MAJ and NDMO Disaster Risk Reduction and Management Capacities for multi-hazard disasters, structures and information flow, roles and responsibilities of the involved agencies.	186	1.8
	NDMO and MAJ multi-hazard early warning system incl stakeholder infrastructure design and capacity building.	49	0.47
	Damage and Loss Information systems, to inform production, disaster risk management, investment decision making, and Sendai Climate framework reporting.	49	0.47
GRAND TOTAL		4483	42.6

Chapter 14: GENDER AND SOCIAL INCLUSION

Annex I

Community Based Rehabilitation (CBR) program, State Welfare Organization (SWO)

CBR started in Iran from 1992 in collaboration of Welfare Organization and the Iranian Ministry of Health and Medical Education. CBR programs have so far been implemented in all 31 Iraanian provinces. The CBR program in Iran involves six types of services: provision of education and training opportunities (e.g. special education in mainstream or special schools, training in ADL skills), early childhood intervention and referral services especially to medical rehabilitation centers which provide rehabilitation aids, creation of micro and macro income generation opportunities and social support through positive attitudes towards PWDs and their community involvement through strengthening their capabilities.

The CBR programs works with the following seven entities: 1-PWDs, 2-Families of PWDs, 3-Community, 4-state (international-regional or local level), 5-NGOs (Non-governmental organizations) in all levels including local, regional, national and international level, 6-medical professionals, health professionals, educators, social scientists and other specialists, and 7-the private sector.

Chapter 15: Economic Impact

Appendix 1: Theoretical Method for Alternative Economic Impact Assessment

From the results of the calculations carried out through a framework of theoretical assumptions (separate from the CGE (computable general equilibrium) model used to estimate shocks to the national economy) it can be shown that the value of damages and losses faced by Lorestan Province is much greater than that of Golestan Province, 66 per cent in Lorestan vs. 34 per cent in Golestan respectively.

The theoretical-based methodology employs several key economic indicators such as population, employment, Gross Domestic Product, capital formation, contributions from three main productive economy sectors (agriculture, industry and services), as well as macroeconomic indicators related to consumption and savings, and the ratio of inequality (Gini Ratio), to calculate the impact of flood disasters on the macro-economy of Golestan and Lorestan Provinces. Using a number of applicable macroeconomic assumptions as shown in Table 1, the macroeconomic impacts in Golestan and Lorestan provinces can be estimated based on the damages and losses, which can then be used to determine strategic steps for post-disaster recovery in the two provinces.

Table 1: Theoretical Macro-Economy Assessment - Without CGE Interdependence

	Units	Lorestan	per cent	Golestan	per cent		Sum
Population	**No.**	1754243		1777014			3.531257
Labour	**No.**	561358	0,32	604185	0,34		1165543
GDP	at $6,300 / L	3536553888		3806363988			7342917876
Capital C		8841384720	2,50	9515909970	2,50		18357294695
Intermediates		884138472	0,25	951590997	0,25		1835729470
GDP growth	**0,03**	106096617	0,03	114.190.920	0,03		220287536
C growth	**0,03**	265241542	0,03	285477299	0,03		550718841
Agr per cent		848772933	0,24	1065781917	0,28		191455.850
Ind per cent		954869550	0,27	1027718277	0,27		1982587827
Serv per cent		1697545866	0,48	1712863795	0,45		3410409662
W/Consumption		2475587722	0,70	2283818393	0,60		4759406116
P/Savings		1060966166	0,30	1522545595	0,40		2583511762
Gini		circa .4		circa .5			
DaLa estimate							
Capital		495117544	0,05	342572759	0,03		837690303
GDP		268778095	0,07	60901824	0,01		329679919
Consumption		24755877	0,07	11419092	0,06		36174969
SUM		788651517	0,66	414893675	0,34		1203545192
L lost	**No.**	56136	0,10	30209	0,05		86345

Notes:

Productivity: 270 million IRR per Labour per Annum @ official $
GDP growth and Capital growth fixed - and at 3 per cent each
Figures for GDP/Capital/INT/C/S are in USD
Estimates bias - circa 17 per cent

Assumptions:			
National			
GDP		8.500.000	Billion IRR
Labor Force	31.000.000	(million persons – formal & informal estd)	
Labor Productivity (billion IRR)	274.19	per L	
Labor Productivity official (million USD)	6.37		
Official $		43,000 R/$	
Gini		0,4	
Loss			
c) Capital		upper estimates used	
d) GDP		upper estimates used	
e) Consumption	upper estimates used		

The resulting calculations estimate that the value of damages and losses faced by Lorestan Province is greater than that of Golestan Province, with a total damages and losses of USD 788.6 million in Lorestan and USD 414,9 million in Golestan for the two provinces respectively. On the estimated numbers of job losses, 56,136 job losses in the Lorestan and 30,209 in Golestan, or 65 per cent and 34 per cent respectively in the two affected provinces.

The theoretical exercise demonstrates that there can be significant impacts on the macroeconomic sector from the two provinces affected by the floods that need strategic recovery plan and stages.

Figure 1 shows that the impact of the floods on GDP and capital consumption is higher in Lorestan than Golestan, 22 per cent and 69 per cent respectively.

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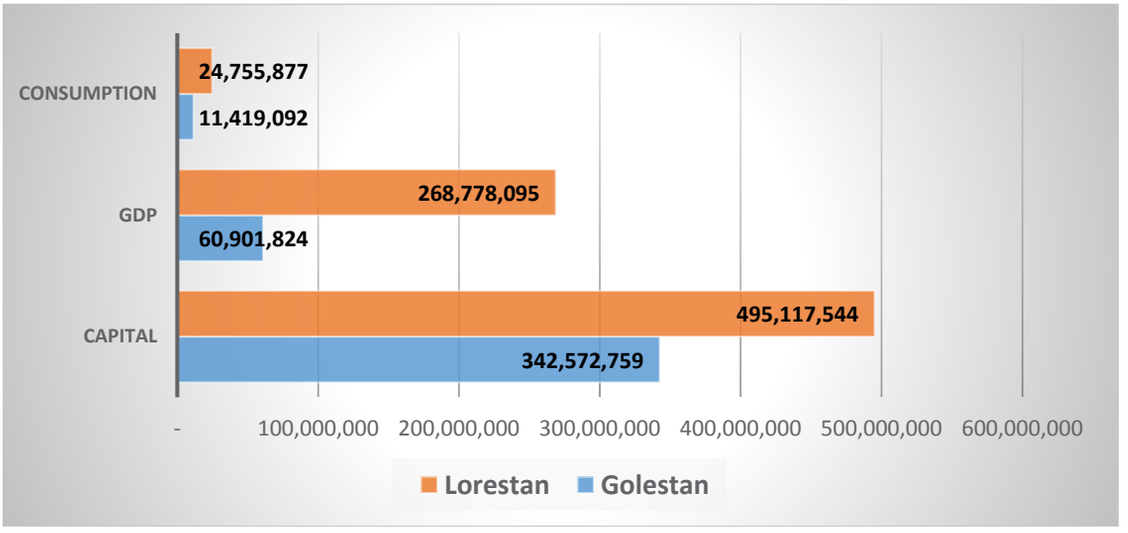

Figure1: Distribution of Capital, GDP and Consumption Contributing to the Impact in two provinces

National Disaster Management
Organization Of Iran

UNITED NATIONS

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