Government of the Islamic Republic of Afghanistan

CURRENT STATE OF EARLY WARNING SYSTEM IN AFGHANISTAN

AN OUTLOOK OF THE FLOOD EARLY WARNING SYSTEM

28 November 2020

This report was developed jointly by the National Environmental Protection Agency (NEPA) of the Islamic Republic of Afghanistan and Afghanistan National Disaster Management Authority (ANDMA) together with United Nations Environment Programme (UNEP), with funding from the Global Environment Facility for the preparation of Afghanistan's Second National Communication. The findings of this report are based on the literature review and the consultation meetings and interviews with the relevant stakeholders at the national and provincial levels.

Acknowledgement

For preparing this report, we would like to acknowledge the support provided by the government line ministries and agencies and the Agha Khan Agency for Habitat (AKAH) for providing unlimited support and data about the EWS in Shughnan district of Badakhshan province.

Suggested Citation

Noori, M & Sherzad, H. (2020). *Current State of Early Warning System in Afghanistan: an outlook of the flood early warning system*. Kabul: National Environmental Protection Agency, Afghanistan National Disaster Management Authority and United Nations Environment Programme

Authors

Mohammad Monib Noori and Mohammad Haris Sherzad, UNEP – Afghanistan.

Design and Layout

Ahmad Reza Amiri, UNEP - Afghanistan

CURRENT STATE OF EARLY WARNING SYSTEM IN AFGHANISTAN

AN OUTLOOK OF THE FLOOD EARLY WARNING SYSTEM

TABLE OF CONTENT

ACRONYMS

AF	Adaptation Fund
AKAH	Agha Khan Agency for Habitat
ALCS	Afghanistan Living Condition Survey
AMD	Afghanistan Meteorological Department
ANDMA	Afghanistan National Disaster Management Authority
ASDC	Afghanistan Spatial Data Centre
ATRA	Afghanistan Telecom Regulatory Authority
AU	Alarm Unit
AVPT	Avalanche Preparedness Team
AWS	Automatic Weather Stations
CBDRM	Community-based Disaster Risk Management
CBEWS	Community-based Early Warning System
CBFEWS	Community-based Flood Early Warning System
CDC	Community Development Council
CERT	Community Emergency Response Team
DA	Data Acquisition
DU	Data Upload
DCC	Disaster Coordinating Council
DDA	District Development Assembly
DDMC	District Disaster Management Committee
DDMP	District Disaster Management Plan
DoHRA	Directorate of Haj and Religious Affairs
DPP	Disaster Preparedness Plan
DRM	Disaster Risk Management
DRRD	Directorate of Rural Rehabilitation and Development
EWS	Early Warning System
FEWS	Flood Early Warning System
FFGS	Flash Flood Guidance System
GCF	Green Climate Fund
GEF	Global Environment Facility
GIRoA	Government of the Islamic Republic of Afghanistan
GLOF	Glacial Lake Outburst Flood
Ha	Hectare
HVRA	Hazard, Vulnerability, Risk Assessment
ICIMOD	International Centre for Integrated Mountain Development
ISDR	International Strategy for Disaster Reduction
JWC	Joint Warning Centre
LiDAR	Light Detection And Ranging
MAIL	Ministry of Agriculture Irrigation and Livestock

ACRONYMS

MRRD	Ministry of Rural Rehabilitation and Development
MoPW	Ministry of Public Works
MoU	Memorandum of Understanding
NDMC	National Disaster Management Commission
NDRRP	National Disasters Risk Reduction Plan
NEWC	National Early Warning Committee
NGO	Non-Governmental Organisation
NSP	National Solidarity Programme
NWARA	National Water Affairs Regulation Authority
LOC	Local Operating Centre
OC	Operations Centre
OIC	Officer In Charge
PDMP	Provincial Disaster Management Plan
PDMC	Provincial Disaster Management Committee
SART	Search and Rescue Team
SERT	School Emergency Response Team
SMS	Short Messaging System
SOP	Standard Operating Procedure
TWLMS	Telemetry-based Water Level Monitoring System
UNDRR	United Nations Office for Disaster Risk Reduction
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar
VDMP	Village Disaster Management Plan
WB	World Bank
WMO	World Meteorological Organization
WMP	Weather Monitoring Post
WRD	Water Resources Department
WWLMS	Wireless Water Level Monitoring System

EXECUTIVE SUMMARY

Figure 1:Deh Shar_Shughnan ©Haris Sherzad @UNEP

Early Warning System (EWS) is an approach adopted by the governments, communities and societies to reduce the risk of potential hazards and enhance resilience. EWS is the most cost-effective and practical measure for disaster risk prevention. The United Nations International Strategy on Disaster Reduction (UNISDR) defines the Early Warning System as: *"The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organisations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss."*

Globally, an estimated 90 % of recorded major disasters caused by natural hazards from 1995 to 2015 were linked to climate and weather, including floods, storms, heatwaves, and droughts. As a re¬sult, direct disaster damage costs are exponentially increas¬ing, from USD 75.5 billion in the 1960s to over a trillion dollars for the 2007-2016 decade

As described at the 3rd International Conference on Early Warning, effective early warning systems must be people-centred and must integrate the following four inter-related key elements:

1. Risk Knowledge
2. Monitoring and Warning
3. Dissemination and Communication
4. Response Capability

For an effective CBEWS, it is crucial to consider all four elements defined for an Early Warning System. The communities and involved institutions: should have a good knowledge of the risks that are threatening them; should monitor the changes in risks and vulnerabilities of the communities; should disseminate and communicate the information and risks provide early warnings, and should have the response capability to reduce the risk once they receive the alerts

Afghanistan, a member of the World Meteorological Organization (WMO), is classified as the least developed country by the UNFCCC, has been devastated not only with the long-lasting civil war but also by natural disasters. Since the 1950s, floods and droughts combined have caused over 5,000 deaths, affected over 21 million people. On the other hand, during this period, river floods and flash floods have inflicted an estimated more than 600 million USD economic losses, which is much higher than the losses imposed by the drought. From 1900 to 2010, the statistics of the fatalities show that more than 50 % of the total deaths due to the natural disasters were related to climate-induced natural disasters.

Hydrological and meteorological data collection and observation in Afghanistan started in the late 1940s, and the analysis started in mid-1950s. The hydrometric network expanded rapidly in the 1960s and 1970s, reaching a peak of 150 in 1980. Before 1979, Afghanistan had one of the most advanced meteorological monitoring systems in the region. Unfortunately, most equipment were rendered non-functional or destroyed due to years of conflict and war. Under the Taliban regime, Afghanistan's Meteorological Department was dissolved, and its weather records were destroyed.

Since 2001, there has been some rehabilitation of non-functional weather stations and installation of new stations. AMD has also been reinstated and is the lead agency in collecting, processing and reporting of weather data including temperature, precipitation and weather forecasts.

In Afghanistan, EWS is included in most of the national disaster-related policies and relevant plans, although there is still lack of a long term strategic early warning system plan.

Though the National Disaster Management Law enacted in 2012, does not explicitly mention the Early Warning System, it emphasises on possible natural and unnatural disasters and reduction of their risks. The development of EWS and its integration into development plans and public policies is one of the principal components of the five-year National Disaster Management Plan, which was developed in 2010. The Strategic National Action Plan (SNAP), developed in 2011, recognises the need for EWS. To help reduce disaster risks, SNAP proposes under strategic objective 3, the development of community-based early warning systems. The Afghanistan National Disaster Management Authority's Strategy, developed in 2015 for four years, proposes an assessment of the existing EWS and design and establishment of a multi-hazard and replicable EWS based on the results of the assessment

ANDMA and its technical partners have made efforts to identify hazard-prone areas of the country and better understand the associated risks to potential natural hazards. However, this risk knowledge remains at a larger scale of provincial levels. Flood and flash flood risks are monitored and forecasted by AMD and NWARA. Both organisations issue warning on flash flood and riverain flood, respectively. The issued warnings are disseminated through their respective websites and social media accounts. However, the country has no defined response plan to the issued warnings.

A systematic network of Early Warning System does not exist in Afghanistan. At the national level, flood risks are forecasted by AMD and NWARA, and warnings are disseminated to the public through their websites and social media accounts. The warnings remain at the scale of a province and do not provide detailed information at the local and watershed level, which is not considered to be efficient for risk reduction.

Throughout the country, AMD owns around 25 active synoptic stations (SYNOP) installed throughout the country, which operate manually. According to AMD, Afghanistan needs around 50 SYNOP stations to provide adequate coverage for weather monitoring throughout the country. NWARA owns 125 hydrological stations and 30 Automatic Weather Stations (AWSs) with snow-monitoring capabilities. These stations do not include the 26 AWSs transferred to AMD. MAIL operates nine agrometeorological stations and 99 automatic rain gauges.

Overall, EWS in Afghanistan requires extensive attention and improvement. There is no doubt that the application of an early warning system is the most cost-effective and efficient measure for disaster prevention. The current setup for EWS faces numerous challenges that need to be addressed. The identified challenges are related to institutional arrangements, technical and technological capacity and financial resources. Each element of the EWS faces several specific challenges that are highlighted in the relevant sections.

1

INTRODUCTION

1.1. INTRODUCTION TO THE REPORT

This report provides a broad overview of the landscape of Early Warning Systems (EWS) for the climate-induced natural hazard with a specific focus on flood in Afghanistan, in order to identify past achievements and current and future entry points for further improvement of the system in the country, with the ultimate goal of reducing disasters risks.

The report is divided into four chapters. The first chapter of the report provides an overview of the basics of an EWS and the CBEWS. The second chapter of the report presents the historical background of climate-induced disasters in the country. The third chapter of the report provides an overview of the current state of EWS in Afghanistan with a specific focus on flood EWS. The chapter focuses on the current legal framework of EWS, the institutional arrangement of EWS, and the current status of FEWS, highlighting its major challenges and provides recommendations. The fourth and last chapter of this report includes the annexes, one of the annexes is the report of a case study on CBEWS installed by AKAH in Shughnan district of Badakhshan province. In the other annex, an institutional arrangement is proposed for EWS in Afghanistan.

The findings of this report have been identified on the basis of existing documents and reports on EWS and Disaster Risk Reduction, individual and group meetings, consultation workshops at national and local levels, and inputs from experts.

This report identifies that, despite having no systematic EWS at the national level, the relevant legal documents recognise the importance of having an effective EWS in order to reduce disaster risks in Afghanistan. Afghanistan has the foundations for the establishment of an efficient institutional arrangement for application of an EWS network at the national level.

1.2. INTRODUCTION TO THE EARLY WARNING SYSTEM

Early Warning System (EWS) is an approach adopted by the governments, communities and societies to reduce the risk of potential hazards and enhance resilience. EWS is the most cost-effective and practical measure for disaster risk prevention. The United Nations International Strategy on Disaster Reduction (UNISDR) defines the Early Warning System as: *"The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organisations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss."*[1]

From 1991 to 2005, due to natural disasters, such as flood, wind storms, droughts and landslides, more than 422 k lost their lives and over 3 billion more have been affected. A devastating cyclone called "Cyclone Nargis" killed over 100,000 and displaced many others.[2]

An estimated 90% of recorded major disasters caused by natural hazards from 1995 to 2015 were linked to climate and weather, including floods, storms, heatwaves, and droughts.[3] As a result, direct disaster damage costs are exponentially increasing, from USD 75.5 billion in the 1960s to over a trillion dollars for the 2007-2016 decade.[4]

At the same time, governments are becoming aware that a paradigm shift from crisis management to risk management is necessary if the finite resources available are spent in the most efficient way to assist the populations at risk to prevent or mitigate disasters. EWS is considered as one of the priority actions in the Hyogo Framework for Action (2005-2015). The framework encourages the development of the community-based (people-centred) EWS. With the adoption of the Paris Agreement on climate change, the Sustainable Development Goals (SDGs) and the Sendai Framework for DRR, the links between climate change adaptation, disaster risk reduction and sustainable development became clearer and internationally recognised. All three global frameworks have specific reference to EWS and recognise the importance of monitoring and early warning in reducing climate and risks vulnerabilities and enhancing resilience.[5]

---

1. (United Nations, 2009)
2. (Jack E, 2010)
3. (UNISDR, 2016)
4. (CRED, 2018)
5. UNDP, 2018

Considering the adverse impacts of climate-induced natural hazards, the world recognised the importance of the early warning system to the safety and wellbeing of human beings. During the past two decades, EWS have gradually received more attention in the framework of the regional and international agreements, conferences, cooperation and action plans.

The application of an effective EWS as a measure for disaster risk reduction and climate change adaptation can save lives and avoids economic losses. Therefore, there has been a global movement in integrating EWS into the global and national policies, strategies and action plans.

1.2.1. ELEMENTS OF EWS

Early warning is a strategy adopted by many societies to reduce the impacts of disasters. EWS are often based on interconnections between visual observations, past expe¬rience, and cooperation to mitigate losses from upcoming hazards.[6]

If correctly implemented, EWS can help to reduce losses of lives and property and to minimise environmental damage. All this coheres in a favourable cost-benefit ratio while also increasing safety.

As described at the 3rd International Conference on Early Warning, effective early warning systems must be people-centred and must integrate the following four inter-related key elements:[7]

- **Risk knowledge**

The knowledge of risk could be increased by systematically collecting data and undertaking risk assessments.

For undertaking the assessment, the following questions should be answered:

- Are the hazards and vulnerabilities well known?
- What are the patterns and trends in these factors?
- Are risk maps and data widely available?

- **Monitoring and warning services**

A climate-induced monitoring and warning system has to be in place considering the findings from the first element. For predicting and forecasting hazards, there is a need for a reliable forecasting and warning system that operates 24/7 using sound scientific basis. Continuous monitoring of hazard parameters and precursors is essential to generate accurate warnings in a timely fashion. Warning services for different hazards should be coordinated where possible to gain the benefit of shared institutional, procedural and communication networks.

Before issuing an accurate warning, the following questions should be answered:

- Are the right parameters being monitored?
- Is there a reliable scientific basis for forecasting?
- Can accurate and timely warnings be generated?

[6]. (Brazzola N, 2018)
[7]. (EWC, 2006)

- **Communication and dissemination**

Effective early warnings have to be communicated and disseminated to people to ensure communities are warned in advance of impending hazardous events and to facilitate national and regional coordination and information exchange. To communicate effective warnings, the message should be clear, simple, and critical. To ensure widespread dissemination of warning to endangered people, we should not stick to only one communication channel.

To ensure that adequate warnings received by the public about the potential risk, the followings questions have to be answered:

- Do warning reach all of those at risk?
- Does the public understand the risks and warnings?
- Is the warning information clear and useable?

- **Response capability**

The fourth key element of an EWS is the response capability. This element is the most important part in EWS circle to safeguard the people being at risk. Communities must understand their risks, respect the warning and know how to react. For this part, education and public awareness are essential for vulnerable communities.

For a successful response capability, the following questions should be answered regularly:

- Are response plans up to date and tested?
- Are the local communities trained on the use of the response plan, and are their traditional knowledge of the communities integrated into the plans?
- Are people prepared to react to warnings?

Nowadays, the global focus is on people-centred early warning systems. The objective of this approach is to enable individuals and communities prone to hazards to act in sufficient time and a convenient way to reduce the contingency of people injury, losses of lives, damage to property and the environment.

For the efficiency of the people-centred EWS, the inclusion and interaction between four key elements: risk knowledge, monitoring and warning services, dissemination and communication and the response capability is essential.

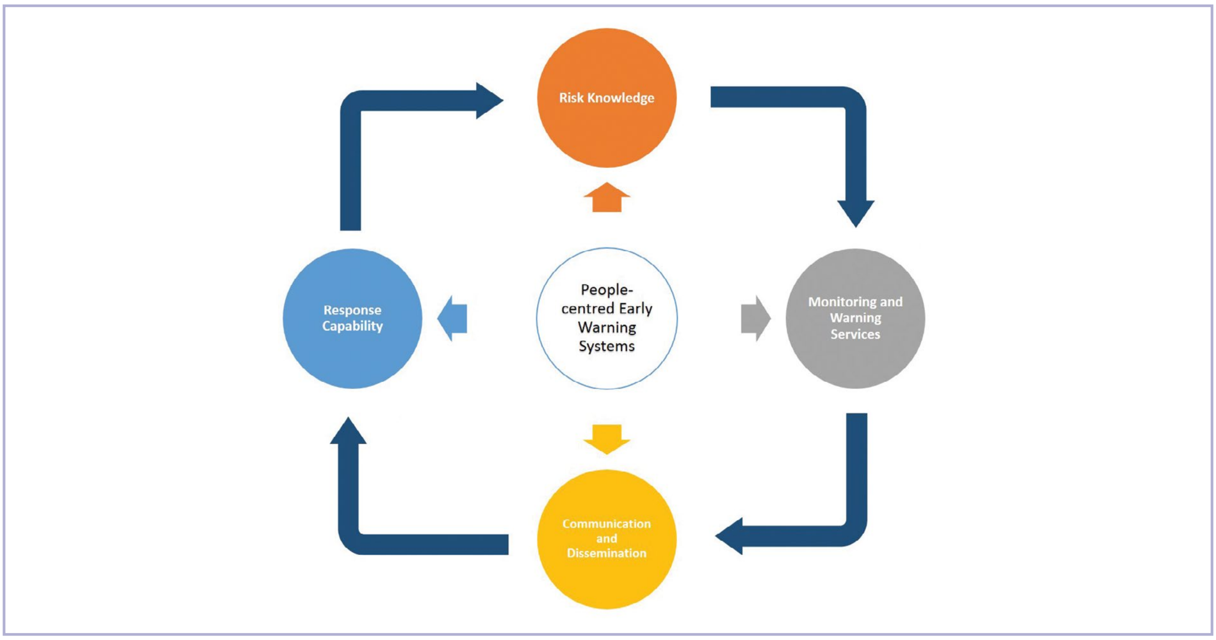

Figure 2: Key elements of an early warning system.

1.2.2. COMMUNITY-BASED EARLY WARNING SYSTEMS

Community-based Early Warning System (CBEWS) is implemented in communities using a "people-centred" approach. CBEWS empowers individuals and communities to use and manage an integrated system of tools and plans, that provide early warnings on hazards to reduce risks.[8]

This system disseminates advance information to vulnerable communities, practitioners and involved organisations, on natural hazards in order to serve for prevention, preparedness, and response efforts. The system plays an important role in enhancing the resilience of hazard-prone communities.

For an effective CBEWS, it is crucial to consider all four elements defined for an Early Warning System. The communities and involved institutions: should have a good **knowledge** of the risks that are threatening them; should **monitor** the changes in risks and vulnerabilities of the communities; should disseminate and **communicate** the information and risks provide early warnings, and should have the **response capability** to reduce the risk once they receive the alerts.[9]

"People-centered" approach is the main feature of a CBEWS. It is important that all members from the vulnerable communities and relevant actors are involved in planning, implementing, monitoring and dissemination of early warning information. Moreover, the community should take ownership of the system for its better functionality and sustainability.

Efforts should be made to employ affordable and easily accessible technologies in a CBEWS. People from the community should be trained on how to use and maintain the technologies used in a CBEWS.

Figure 3: Hydrological Observations Station, ©North River Basin

[8]. (ICIMOD, 2019)
[9]. (Cowan, O'Brien, & Rakotomalala-Rakotondrandria, 2014)

2

HISTORICAL BACKGROUND OF CLIMATE-INDUCED NATURAL DISASTERS IN AFGHANISTAN

HISTORICAL BACKGROUND OF CLIMATE-INDUCED NATURAL DISASTERS IN AFGHANISTAN

Climate change in Afghanistan is not an uncertain, "potential" future risk but a genuine, present threat whose impacts have already been felt by millions of farmers and pastoralists across the country. The poorest people, particularly subsistence farmers and pastoralists who are often already living on marginal land, are also those who suffer most from climate change.[10]

Afghanistan, a member of the World Meteorological Organization (WMO), is classified as the least developed country by the UNFCCC, has been devastated not only with the long-lasting civil war but also by natural disasters. Earthquake and hydrometeorological hazards are the two main natural disasters. It is quite interesting to note that almost half of the death toll was due to hydrometeorological hazards which mainly comprised flash floods/floods, droughts, landslides and mudflows, sand storms, extreme heat and cold, and avalanches[11].

Negative impacts of floods caused by heavy spring rainfall have been felt across a range of different livelihood zones from the mountainous areas in the north-east and centre of the country, to the hilly border areas in the south-east, all the way down to the flat, arid southern provinces. These are zones where heavy precipitation events have increased by 10 to 25 % in the past thirty years, and where livelihoods are dominated by agriculture and pastoralism both highly sensitive to flooding.

Afghanistan is recurrently hit by natural disasters causing losses to lives, livelihoods and property. In recent decades, this has led to massive problems of food insecurity and population exodus from the worst-hit areas. Since the 1950s, floods and droughts combined have caused over 5,000 deaths, affected over 21 million people.[12] On the other hand, during this period, floods and flash floods have inflicted an estimated more than 600 million USD economic losses, which is much higher than the losses imposed by the drought.

According to a recent study, using climate data from a base period of 1976-2005, on the one hand, the current temperature projections for Afghanistan until 2050 show a considerable increase in temperature across the whole country. Especially hard hit are high mountain areas of the Central Highlands and Northeast that will likely see temperature increases of at least to 2°C by 2050. On the other hand, current precipitation projections for Afghanistan until 2050 show that the Northern areas of the country may see an annual decrease of up to 22 mm of rain, while the far Southwest provinces of Nimroz and Farah may see a moderate increase in rain.[13]

From 1900 to 2010, the statistics of the fatalities show that more than 50 % of the total deaths due to the natural disasters were related to climate-induced natural disasters.

[10]. (NEPA, UNEP, 2016)
[11]. (AMD, 2020)
[12]. (EM-DAT, 2020)
[13]. (NEPA, UNEP, 2016)

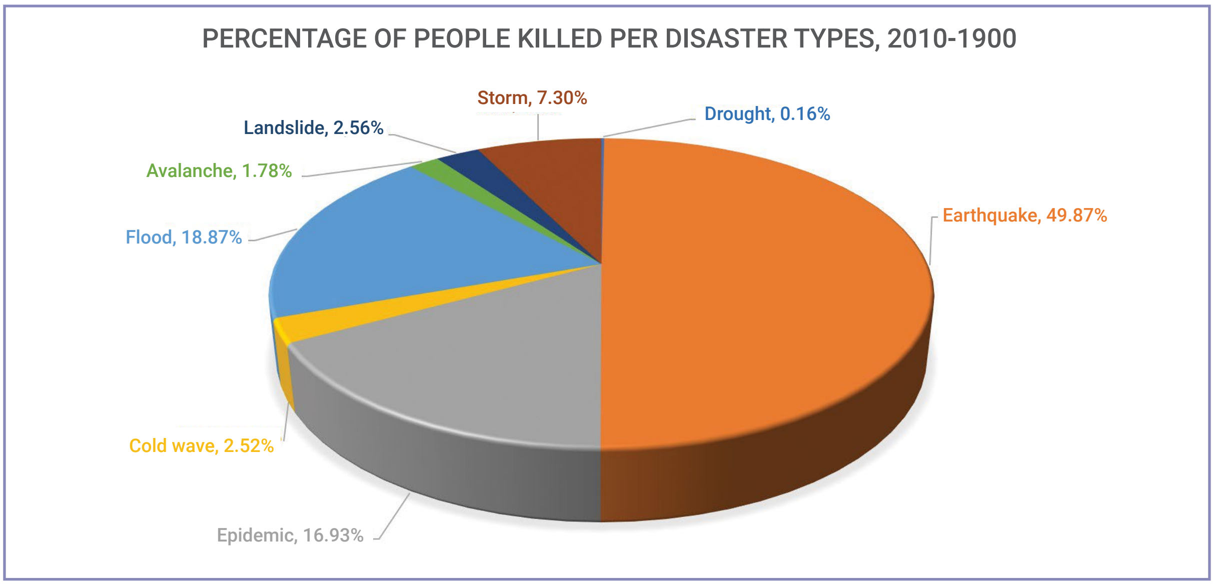

Figure 4: History of natural disasters in Afghanistan.[14]

2.1. FLOODS INCLUDING FLASH FLOODS

Afghanistan has been vulnerable to the Hydrometeorological hazards (including floods, landslides, droughts and extreme weather). According to the analysis done by the UNDP in 200 countries about the vulnerability of the countries to various natural disasters, Afghanistan was ranked 17th most vulnerable country to floods.[15]

Based on the data from AMD, between 1980 – 2015, almost 15,000 people have lost their lives due to hydrometeorological disasters in Afghanistan, with the highest share of over 31 % because of floods and flash floods.

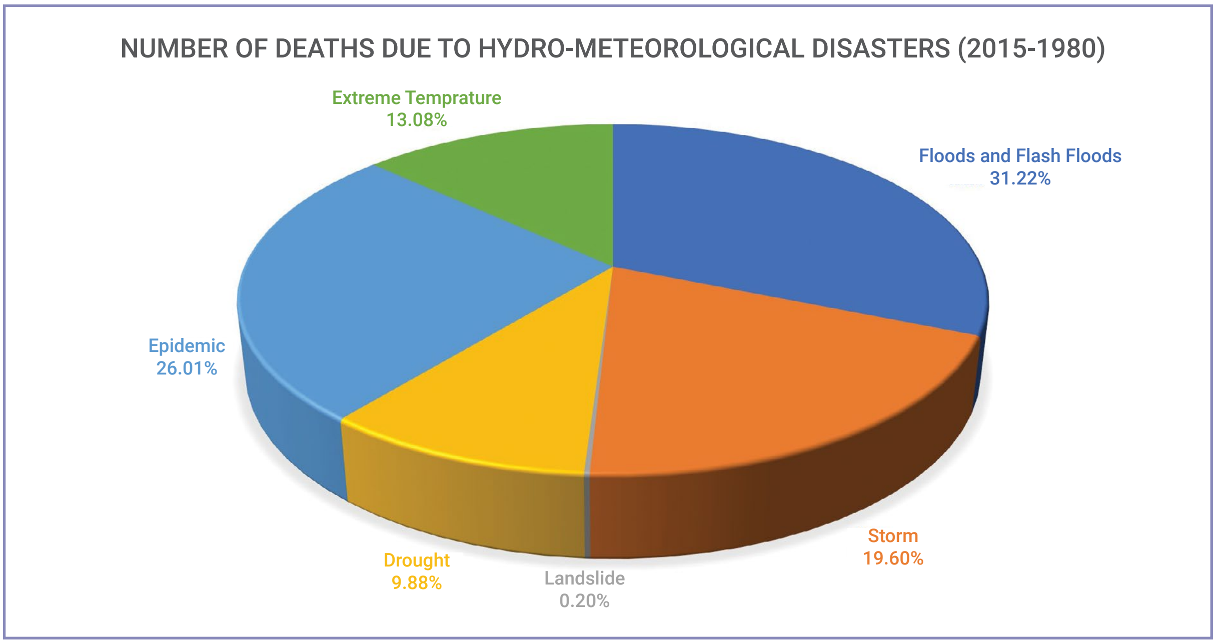

Figure 5: Deaths statistics due to climate-induced natural disasters in Afghanistan.[16]

[14]. (ANDMA, 2011)
[15]. (ANDMA, 2015)
[16]. (AMD, 2020)

In Afghanistan, winter floods start in January and continue till May. Flooding is the most frequently occurring natural hazard in Afghanistan. 21 out of 34 provinces in the country are vulnerable to floods. The southwest part of Afghanistan is highly drought-prone, and the western and central belt is highly flood affected. However, the southwest and few northern provinces of Afghanistan (Heart, Ghor, Urozgan, Jawzjan, Balkh and Faryab) are severely affected by both, flood and drought.[17]

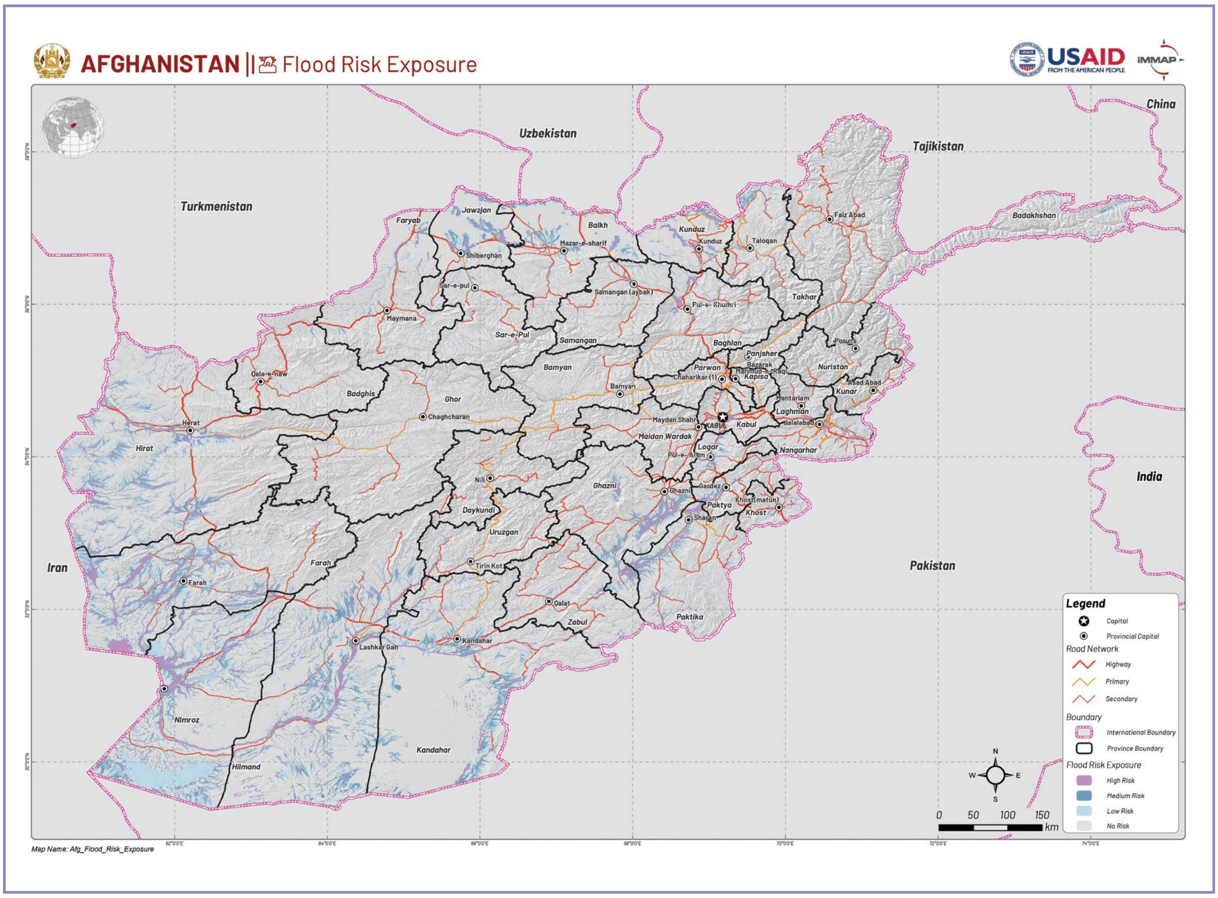

Figure 6: Afghanistan Floods Risk Exposure Map.[18]

As per Afghanistan Natural Disasters Atlas, approximately 7.5 million population of the country is vulnerable to floods. Out of this 7.5 million, 1.29 million are prone to a high threat from floods, while 3.1 million are on average and 3.19 million on low danger respectively.

The statistic of the vulnerable population and area from floods by provinces are provided in table 1 below. For the identification of the hazard zones, the method of the return period was used.

[17]. (Gupte, 2010)
[18]. (iMMAP, 2020)

Table 1: Afghanistan Provinces Flood Risk Exposure Statistics.[19]

Number	Provinces	Population Vulnerable to Floods			Area Vulnerable to Flood in Km^2		
		Low Risk	Medium Risk	High Risk	Low Risk	Medium Risk	High Risk
1	Kabul	123.71 K	89.35 K	31.41 K	148	148	72
2	Kapisa	51.52 K	27.36 K	8.04 K	50	48	25
3	Parwan	46.48 K	39.63 K	20.45 K	85	126	64
4	Wardak	46.57 K	46.84 K	23.67 K	142	224	114
5	Logar	62.53 K	56.84 K	35.89 K	231	247	122
6	Nangarhar	211.74 K	103.68 K	56.60 K	274	271	120
7	Laghman	31.39 K	24.39 K	11.68 K	63	91	59
8	Panjshir	12.53 K	16.15 K	13.18 K	28	61	23
9	Baghlan	115.25 K	118.50 K	58.60 K	392	545	257
10	Bamyan	35 K	53.50 K	33.39 K	165	348	194
11	Ghazni	183.94 K	199.90 K	74.67 K	1,110	1,459	706
12	Paktia	86.70 K	83.34 K	22.17 K	233	312	109
13	Kunar	35.06 K	37.68 K	18.06 K	60	108	47
14	Nooristan	12.72 K	15.40 K	19.53 K	63	150	83
15	Badakhshan	58.34 K	89.74 K	37.68 K	456	881	308
16	Takhar	130.41 K	103.42 K	23.93 K	277	371	113
17	Kunduz	148 K	123.96 K	70.89 K	362	394	291
18	Balkh	198.88 K	127.50 K	51.72 K	867	829	259
19	Samangan	33.12 K	37.08 K	26.38 K	218	375	172
20	Sarepul	61.75 K	88.76 K	51.51 K	222	413	230
21	Ghor	74.70 K	89.62 K	46.13 K	382	686	322
22	Daikundi	23.24 K	27.84 K	20.80 K	125	278	170
23	Uruzgan	44.17 K	46.53 K	26.92 K	175	285	158
24	Zabul	32.59 K	30.99 K	7.85 K	533	625	204
25	Paktika	58.69 K	78.34 K	24.96 K	779	1,342	582
26	Khost	52.51 K	39.52 K	10.54 K	147	165	50
27	Jawzjan	109.46 K	106.08 K	45.64 K	727	830	344
28	Faryab	111.98 K	107.71 K	37.10 K	442	628	265
29	Badghis	69.60 K	96.86 K	43.89 K	301	534	242
30	Herat	329.96 K	289.70 K	106.17 K	3,160	3,441	1,113
31	Farah	114.89 K	139.29 K	39.93 K	3,350	4,382	1,663
32	Helmand	168.63 K	175.41 K	97.31 K	4,235	5,061	1,702
33	Kandahar	279.09 K	234.09 K	47.05 K	3,058	3,241	705
34	Nimroz	35.05 K	64.93 K	49.68 K	4,929	3,741	1,531
Total		**3.19 M**	**3.01 M**	**1.29 M**	**27,790**	**32,639**	**12,417**

According to this table, 3.85 % of the total population and 1.93 % of the total land of the country is highly prone to the risk of floods.

[19]. (ANDMA, 2020)

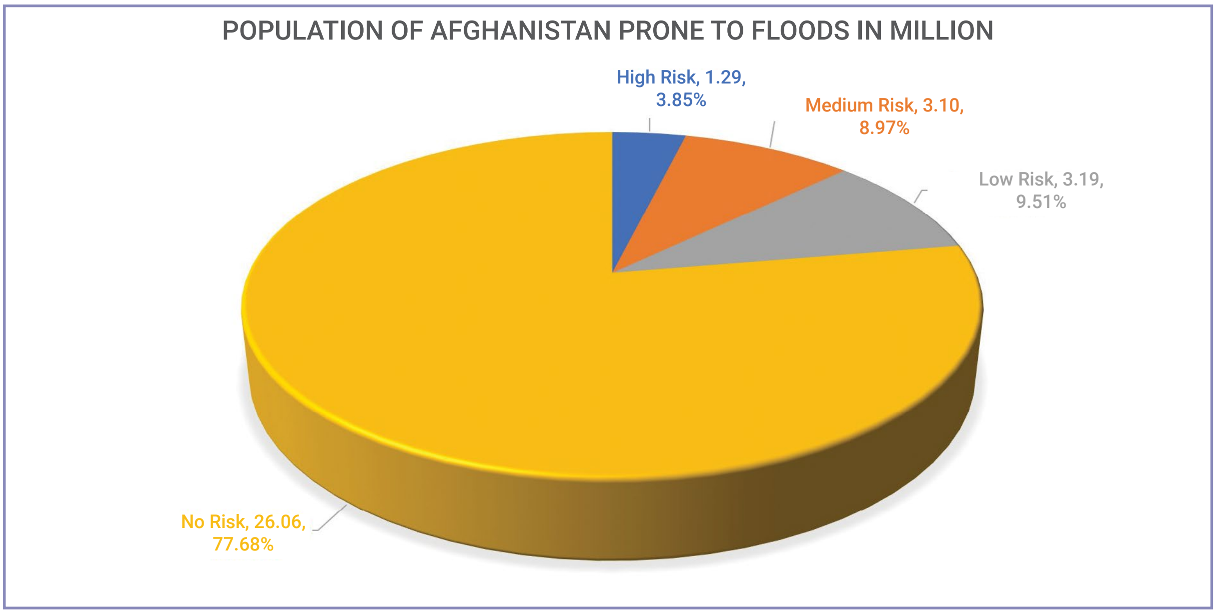

Figure 7: Statistics of Afghan population vulnerable to floods[20]

According to the Disaster Risk Profile of Afghanistan, approximately 100,000 people are affected by flood every year in the country. It is also estimated that extreme events from river flooding could potentially cost over 500 million USD. Due to climate change and socio-economic growth of the country, it is projected that the number of people affected by flooding every year could increase more than double by 2050.

Among low-income countries, Afghanistan stands in second place in terms of fatalities from natural disasters between 1980 and 2015. For every 1 million Afghans 1,150 people die in Afghanistan. 50 % of them are because of the geophysical and weather relevant events.[21]

Flooding in May 2014, affected 90,000 people and resulted in the displacement of 20,000 people with economic losses of over 100 million USD in 14 northern provinces of the country.

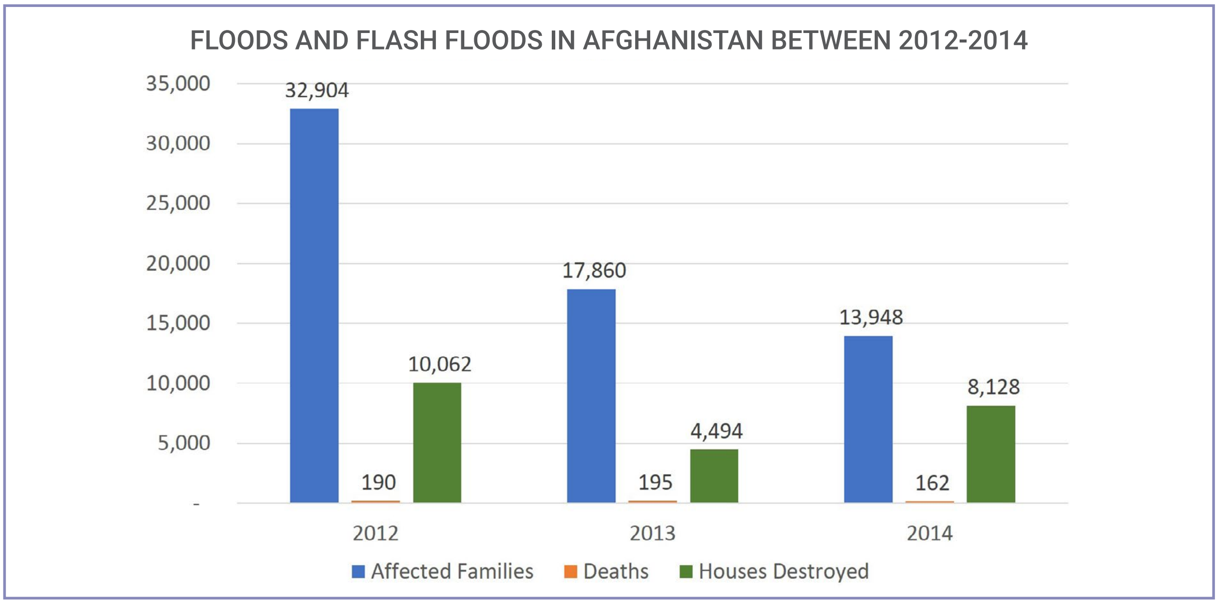

Figure 8: Floods and flash floods impacts in Afghanistan.[22]

[20]. (ANDMA, 2020)
[21]. (WB, 2017)
[22]. (ANDMA, 2018)

More recently, in August 2020, colossal flash floods occurred in northern and eastern Afghanistan. Massive flash floods in Parwan killed over 100 and injured over 150 people.[23] It also displaced more than 3,000 people. Due to this unexpected flash flood, 234 houses were partly or wholly destroyed.[24]

In addition to the floods in Parwan, in another occasion in eastern Nangarhar province, 16 people, including 15 children, were killed and dozens of houses destroyed. Also, in central Wardak province, two people died and five injured while a flash flood hits the province in August 2020. It also damaged more than hundreds of hectares of agricultural land and several residential houses.

2.2. AVALANCHES

Avalanches are masses of snow, ice, and rocks that fall rapidly down a mountainside. An avalanche is a rapid flow of snow down a hill or mountainside. Although avalanches can occur on any slope given the right conditions, certain times of the year and certain locations are naturally more dangerous than others. Wintertime, particularly from December to April, is when most avalanches tend to happen. However, avalanche fatalities have been recorded for every month of the year.

Avalanches in Afghanistan are most likely to happen in the winter months (January to March) when there is a large amount of snowfall in the mountainous regions. Avalanches have the potential to destroy communication lines, the electric grid, road networks, homes, and livestock. This results in a negative impact on the local economy.[25]

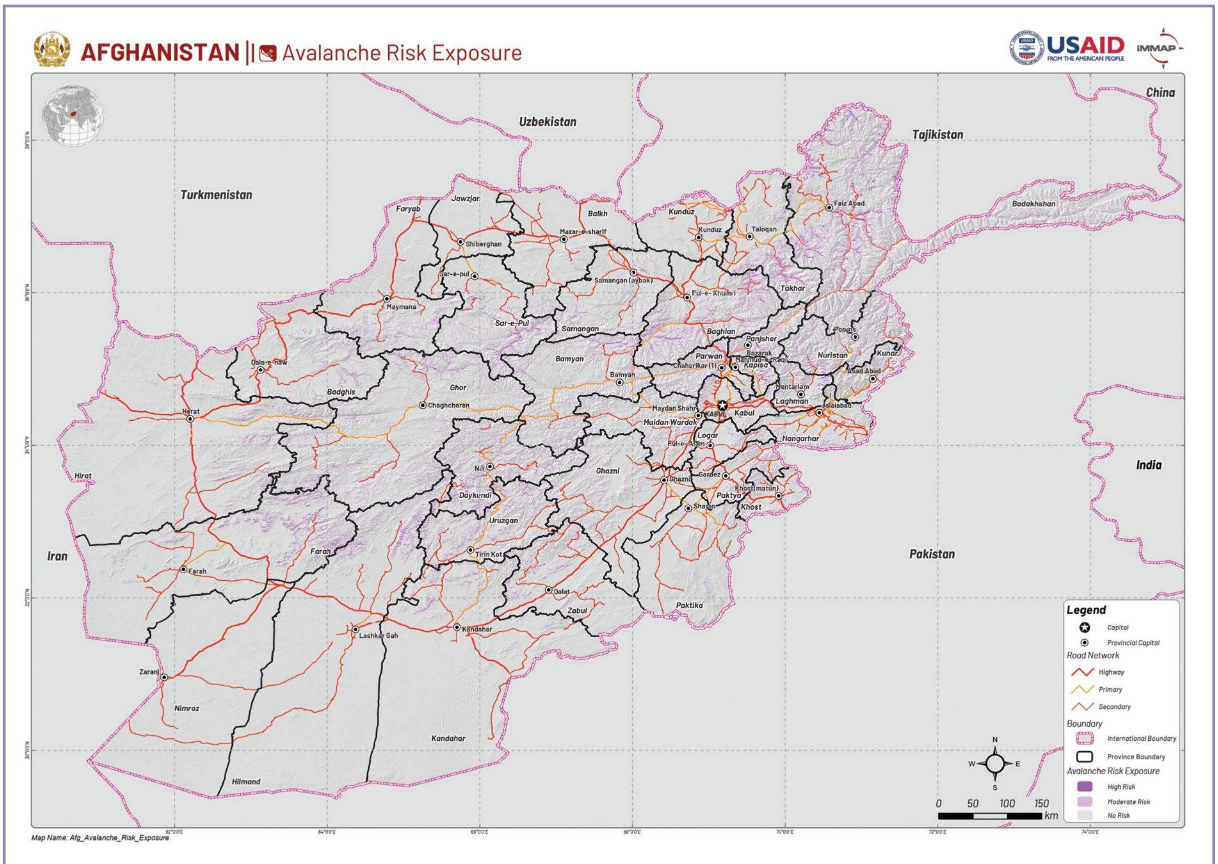

Figure 9 Avalanche Risk Exposure Map of Afghanistan.[26]

[23]. (Aljazeera, 2020)
[24]. (NSIA, 2020)
[25]. (USAID, 2020)
[26]. (iMMAP, 2020)

Due to a mountainous topography which lays the foundation for the avalanches, in Afghanistan, especially the Hindukush mountain range, snow avalanches affect people. With the current speed of changing the climate, on the one hand, due to the rising temperature, the risk of avalanches will be reduced in the lower-lying areas, on the other hand, the frequency of avalanches will be increased in the higher altitude areas such as the Salang Pass.

Afghanistan is a large and diverse landscape that suffers from a variety of climate-based hazards, of which, avalanches have a significant impact on the rural population in 11 out of the 34 provinces. From 2012 to 2016 there were a total of 16,235 people affected by avalanches and 389 casualties.[27]

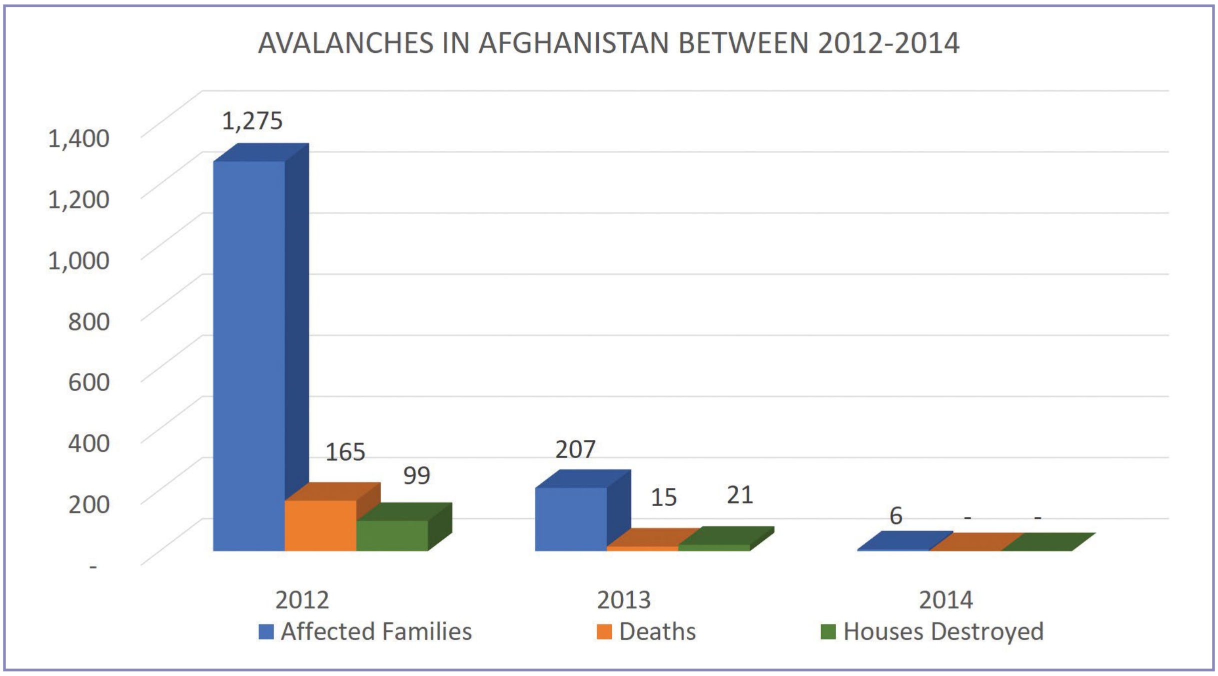

Figure 10: Avalanches impacts in Afghanistan.[28]

In recent years, the frequency of avalanches has been increasing. In 2017, avalanches killed 268 people 198 of whom were residents of Panjshir province, while more than 100 people were injured. In 26 provinces of the country, more than 2 million people are highly vulnerable to avalanches.[29]

27. (USAID, 2020)
28. (ANDMA, 2018)
29. (ANDMA, 2018)

Table 2 below provides the information on the vulnerability of the provinces from avalanches:

Table 2: Afghanistan Provinces Avalanche Risk Exposure Statistics[30]

Number	Provinces	Population Vulnerable to Floods		Area Vulnerable to Flood in Km^2	
		Low Risk	High Risk	Low Risk	High Risk
1	Kabul	7.8 K	1.62 K	297	63
2	Kapisa	17 K	8.58 K	284	86
3	Parwan	44.3 K	9.99 K	713	69
4	Wardak	11.4 K	84	517	7
5	Logar	2.85 K	474	207	11
6	Nangarhar	9.44 K	2.75 K	257	48
7	Laghman	8.15 K	6.41 K	264	90
8	Panjshir	50.1 K	12.4 K	670	50
9	Baghlan	53.5 K	20.4 K	2.05 K	364
10	Bamyan	46.8 K	10.9 K	1.32 K	134
11	Ghazni	13.5 K	433	671	17
12	Paktika	414	100	104	13
13	Paktia	8.59 K	3.46 K	243	26
14	Khost	3.01 K	773	113	33
15	Kunar	14.8 K	9.05 K	282	116
16	Nooristan	30.5 K	10.2 K	1.4 K	93
17	Badakhshan	138 K	73.3 K	6.16 K	891
18	Takhar	32.9 K	18.4 K	1.15 K	225
19	Kunduz	0	0	7	0
20	Samangan	16.2 K	2.37 K	562	75
21	Balkh	3.33 K	412	214	24
22	Sarepul	37.2 K	17.2 K	1.31 K	236
23	Ghor	37.5 K	20.3 K	2.06 K	348
24	Daikundi	49.1 K	12 K	2 K	415
25	Uruzgan	3.75 K	675	989	206
26	Zabul	1.71 K	643	481	139
27	Kandahar	749	123	350	145
28	Jawzjan	333	0	12	1
29	Faryab	5.07 K	5.81 K	485	116
30	Helmand	1.86 K	1.01 K	654	244
31	Badghis	11.2 K	6.15 K	553	110
32	Herat	3.82 K	2.04 K	810	179
33	Farah	2.44 K	2.67 K	1.6 K	534
34	Nimroz	0	0	0	0
Total		**668 K**	**261 K**	**28.8 K**	**5.12 K**

The provinces that are highly vulnerable to avalanches are Badakhshan, Bamyan, Daikundi, Parwan, Takhar, Nooristan and Laghman, respectively.

[30]. (ANDMA, 2020)

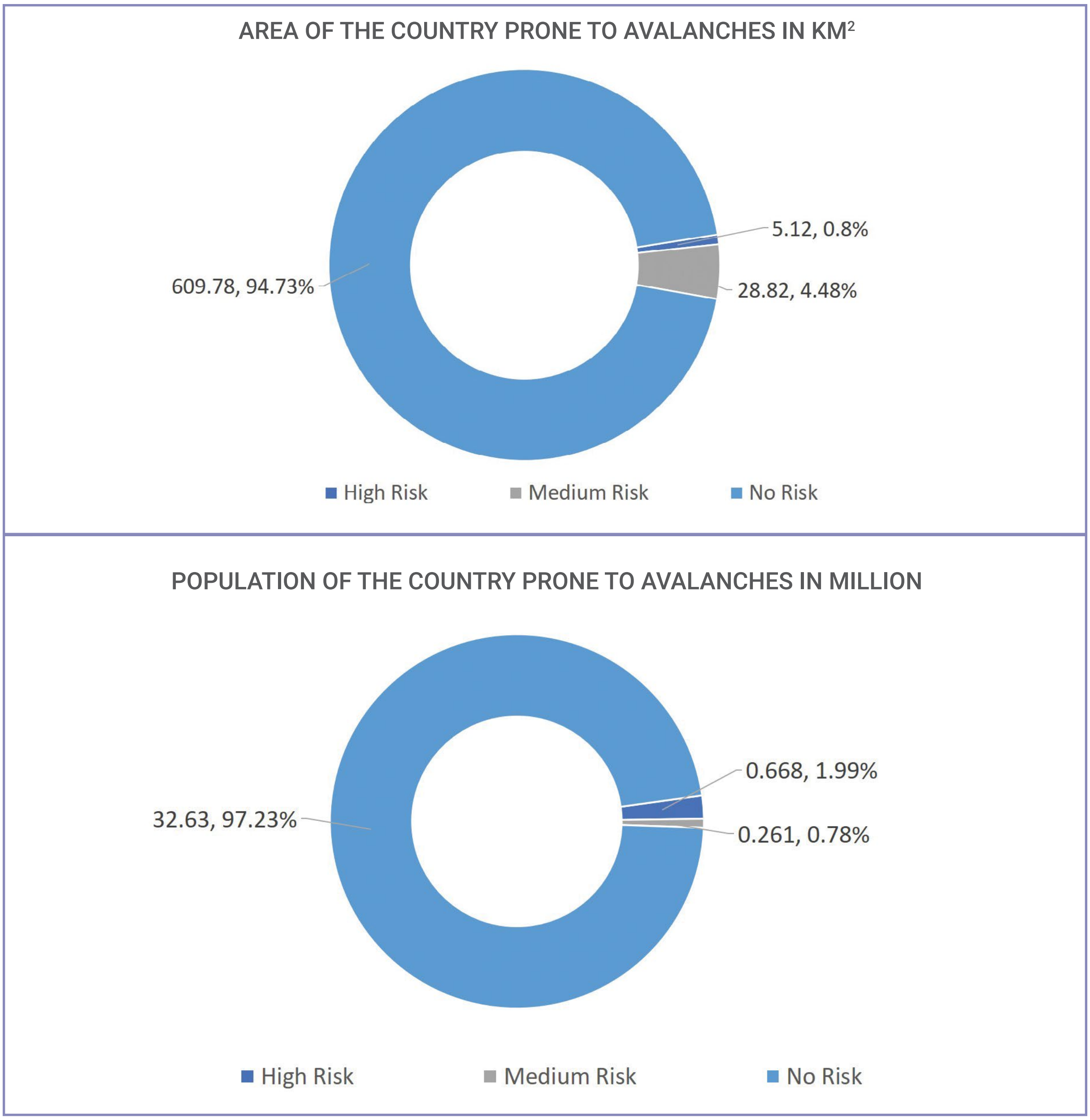

Figure 11: Afghanistan population and area prone to avalanches.[31]

According to Disaster Risk Profile of Afghanistan, from 2005 to 2015, almost 153,000 people were affected by avalanches in the country. The profile also estimates that only in Badakhshan province, 990 million USD assets are exposed to avalanches. While all over the country, over 10,000 km roads and 4 billion USD of assets are threatened by avalanches.

31. (ANDMA, 2020)

3

CURRENT STATE OF THE EWS IN AFGHANISTAN

CURRENT STATE OF THE EWS IN AFGHANISTAN

Hydrological and meteorological data collection and observation in Afghanistan started in the late 1940s, and the analysis started in mid-1950s. The hydrometric network expanded rapidly in the 1960s and 1970s, reaching a peak of 150 in 1980.[32]

Before 1979, Afghanistan had one of the most advanced meteorological monitoring systems in the region. Unfortunately, most equipment were rendered non-functional or destroyed due to years of conflict and war. Under the Taliban regime, Afghanistan's Meteorological Department was dissolved, and its weather records were destroyed under the pretext that weather forecasting was sorcery.[33]

Since 2001, there has been some rehabilitation of non-functional weather stations and installation of new stations. AMD has also been reinstated and is the lead agency in collecting, processing and reporting of weather data including temperature, precipitation and weather forecasts.

As mentioned in the previous chapters, Afghanistan is classified as a least developed member of the WMO, whose journey of hydromet data collection and analysis has been just restarting. This is while the country is one of the most vulnerable from the adverse impacts of climate change and still suffer from a constantly increasing poverty. In 2017, more than 55 % of the total population of the country lived under the poverty line.[34]

The absence of accurate forecasting and weather information resulted in hundreds of millions of USD economic and thousands of lives in the past two decades. One of the most affected sectors was the agriculture and livestock sector, which is the foundation of Afghanistan's economy and livelihoods, supporting some 80 % of the country's population, either directly or indirectly. This chapter focuses on the current state of the EWS for flood and flash flood in Afghanistan.

3.1. POLICY CONTEXT OF EARLY WARNING SYSTEMS

In Afghanistan, EWS is included in most of the national disaster-related policies and relevant plans, although there is still a lack of long term strategic plan for the early warning system.

Though the National Disaster Management Law enacted in 2012, does not explicitly mention the EWS, it emphasises on the prevention of possible natural and unnatural disasters and coping of their risks. The development of EWS and its integration into development plans and public policies is one of the principal components of the five-year National Disaster Management Plan, which was developed in 2010.[35] The Strategic National Action Plan (SNAP), developed in 2011, recognises the need for EWS. To help reduce disaster risks, SNAP proposes under strategic objective 3, the development of community-based early warning systems.[36] The Afghanistan National Disaster Management Authority's Strategy, developed in 2015 for four years, proposes an assessment of the existing EWS and design and establishment of a multi-hazard and replicable EWS based on the results of the assessment.[37]

Recently, to achieve a considerable reduction in disaster risks and their associated impacts, the Government of the Islamic Republic of Afghanistan has developed Afghanistan Strategy for Disaster Risk Reduction (ASDRR) in line with the Sendai Framework for DRR (SFDRR), in 2018. ASDRR aims to contribute to the achievement of global targets set under SFDRR, and foster the implementation of SFDRR. Under this strategy and in line with SFDRR, Afghanistan has set the target of substantially increasing the availability of and access to multi-hazard early warning systems by 2030.[38]

---

[32]. (WB, 2018)
[33]. (NEPA, 2018)
[34]. (NEPA, 2019)
[35]. (ANDMA, 2010)
[36]. (GIRoA, 2011)
[37]. (ANDMA, 2015)
[38]. (SMDM & ANDMA, 2018)

Relying on the national and international frameworks as mentioned above, adequate institutional arrangement, strong technical capacity, modern and local technologies and engagement of multi-stakeholders, there is much that can be done for an effective network of EWS throughout the country.

3.2. INSTITUTIONAL ARRANGEMENTS FOR EARLY WARNING SYSTEMS

The current intuitional arrangement for EWS divides responsibilities among various institutions. This division of responsibilities raises some coordination and communication challenges among the involved institutions, which adversely impacts on the effectiveness of the EWS in the country.

The National Disaster Management Commission (NDMC) is the supreme governing body, in the institutional framework of disaster management in Afghanistan. The first voice president chairs the commission, which is composed of the relevant government institutions. NDMC is the principal body for setting out national policy direction towards reducing risk and vulnerability and responding to emergency situations. Members of the National Commission represent key sectors that are critical in managing disasters. The Afghanistan National Disaster Management Authority (ANDMA), established in 1971[39], is the principal executing body at national level acting as the Secretariat for NDMC. Working in coordination with line ministries, ANDMA's principal role is to coordinate all process related to disaster mitigation, preparedness and response.[40] International Organisations involved in disaster response, relief, rehabilitation and mitigation engage directly with the respective executing agencies of the Government of Afghanistan, based on the overall direction set by the National Commission and pro-actively coordinated by the ANDMA. ANDMA has provincial offices in all 34 provinces of the country. At the provincial level Disaster Management Committees /Commissions (PDMCs) are responsible for the coordination of the DRR and act as the counterparts to NDMC. As per Article 15 of National Law on Disaster Response, Management and Preparedness, the provincial governors lead, and representatives of concerned departments support the PDMCs. At the district level, the district governor plays the lead coordinating role in heading the District level Disaster Management Committee (DDMC). The District Development Assembly (DDA), municipalities and other concerned agencies provide required support to DDMC. At the local level, the Community Development Councils (CDCs) established under the National Solidarity Programme (NSP) of the MRRD, play an essential role in disaster management at the local level. Most of the CDCs have established Community Emergency Response Teams, which intervene during an emergency situation at the village and CDC level.

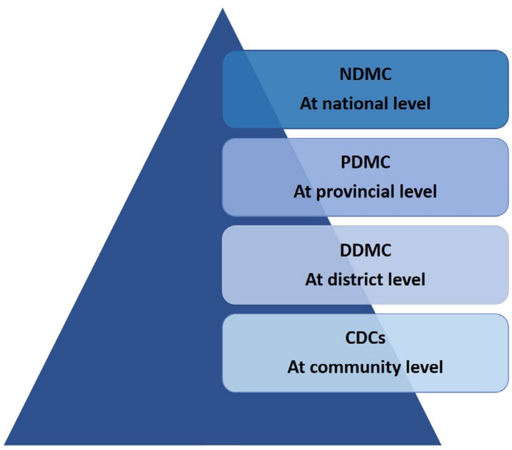

Figure 12: Disaster management pyramid in Afghanistan.

[39]. Initially established as the Office of Disaster Preparedness in 1971, became the Department of Disaster Preparedness in 2003 and ANDMA in 2006.
[40]. (SMDM & ANDMA, 2018)

Established in 1955, the Afghanistan Meteorological Department (AMD)[41] functions as part of the Afghanistan Civil Aviation Authority, which is mainly responsible for providing countrywide meteorological services. AMD is responsible for monitoring and analysing weather, forecasting, early warning, and archiving weather and climate data.[42] The General Directorate of Water Resources functions under the umbrella of the National Water Affaires Regulation Authority is responsible for collection and analysis of hydrological data, and forecast of riverain floods. The directorate has established a Flood and Drought Forecasting Division, which is currently responsible for predicting annual surface water resources and planning further to enhance its flood forecasting and early warning services.

Based on a recent presidential decree, a National Early Warning Committee had been established in 2019. The committee is led by the National Statistic and Information Authority (NSIA) and has about 25 members from different governmental organisations. Non-governmental organisation and relevant UN Agencies, are involved in the committee as technical supporting and observer "members". This committee has further divided into three sub-committees, namely; Hydrometeorology, Drought and Famine, and Emergency Sub-committees. The National Committee had several coordination meetings in 2019; however, due to the COVID19 pandemic, the meetings of the committee did not happen as per usual, except for a few meetings in 2020. During the seasons with a high risk of disasters, the committee meets on a weekly or biweekly basis, while throughout the year, in normal circumstances, the committee meets every month, with some ad-hoc meetings based on the needs.[43]

Currently, there are various institutions involved in the EWS, which require a better institutional arrangement, continuous communication and strong coordination among and between themselves.

ANDMA as the authority responsible for the dissemination of warnings, get the warning from the website and social media of AMD and NWARA. There is no official flow of warning between AMD, NWARA and ANDMA. From its HQ, ANDMA transfer the issued warnings to its relevant provincial offices. At the provincial level, the warning is communicated with vulnerable districts through ANDMA and Governor Offices. If the monthly meeting of PDMC falls between the issued warning and the forecasted event, the issue is raised in the meeting as well. Rarely, the Directorate of Hajj and Religious Affairs at the provincial levels are assigned for passing the warning to the concerned people through Mosques. At the district level, if the warning reached the District Governor Office, it is transferred to the people through Mosques and CDCs. Figure 11 illustrates the flow of warnings based on the explanations provided by officials at the national and provincial levels. However, this is not the case for all provinces due to many challenges.

41. Initially established as the Afghanistan Meteorological Authority under the Ministry of Transport and Civil Aviation; the name was changed to Afghanistan Meteorological Department (AMD) upon the creation of the Afghanistan Civil Aviation Authority (ACAA) in 2013.
42. (World Bank, 2018)
43. (Saboori, 2020)

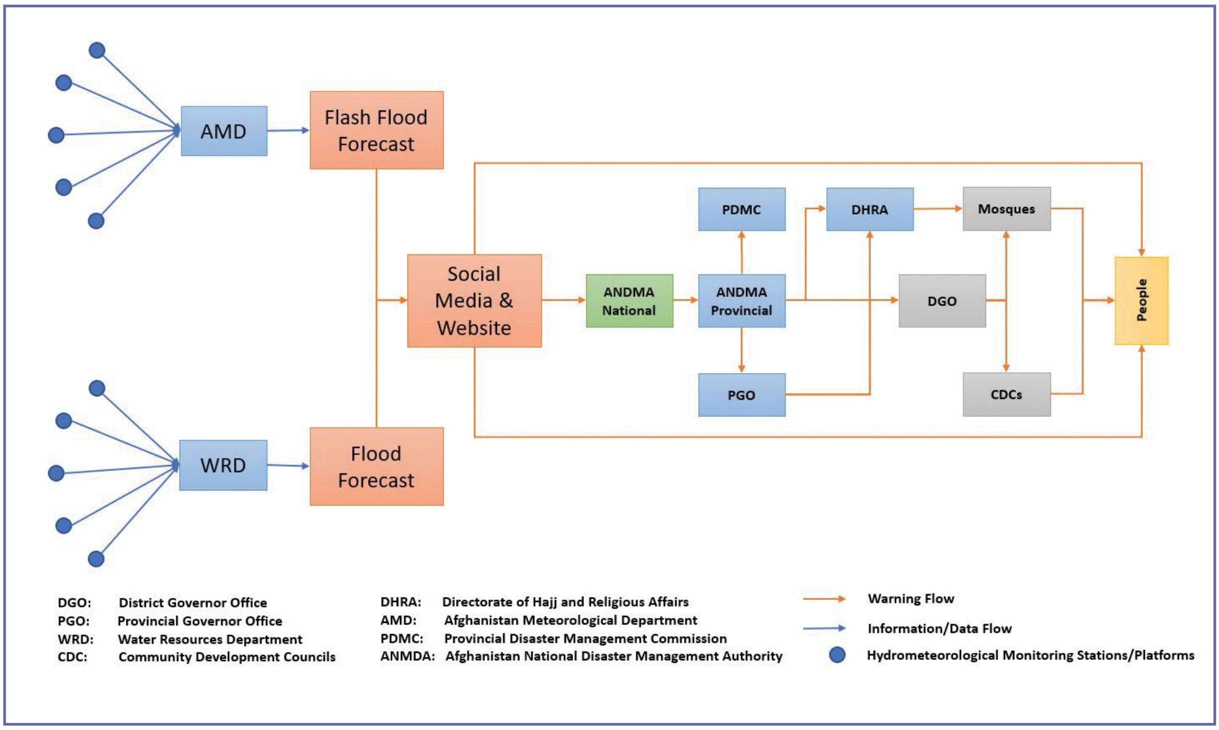

Figure 13: The current institutional arrangement for early warnings

As illustrated in figure 11, AMD and WRD, through their hydrometeorological monitoring stations, monitor different parameters, forecast riverain and flash floods, and issue alerts. They share warnings through different media platforms such as their websites and social media accounts.

3.3. FLOOD EARLY WARNING SYSTEM

While the trend of non-climatic disasters does not show radical changes, weather-related events such as floods, droughts and storms are substantially increasing in the last decades. Severe flooding in 2005 and 2006 made thousands homeless, and destroyed agricultural land, livestock and infrastructure.

Floods start in March and continue until May. Twenty out of thirty-four provinces in Afghanistan are vulnerable to river flooding. The Western region and central belt are at risk of floods. However, the South West and few Northern provinces of Afghanistan (Herat, Ghor, Urozgan, Jozjan, Balkh and Faryab) can be severely affected by both, flood and drought.

In Afghanistan, the responsibilities of the flood forecast are divided between AMD, which is responsible for flash flood forecasts, and the NWARA responsible for riverain flood forecast.

Efforts have been made in recent years, jointly by the government of Afghanistan and the supporting international and non-governmental organisations to implement some pilot early warning systems. However, the early warning system in Afghanistan requires a significant amount of investment and technical support.

3.3.1. EXISTING FLOOD EARLY WARNING SYSTEMS

Apart from the flood forecast by AMD and the NWARA at the national level, a number of specific initiatives for EWS are taken by the government and its partners at the local level. The existing flood early warnings briefly described below.

- **Community-based Flood Early Warning System (CBFEWS)**

The International Centre for Integrated Mountain Development (ICIMOD) has developed a model of CBFEWS which is based on a simple and low-cost instrument. The instrument is installed in the upstream and provides a real-time warning to downstream vulnerable communities.

In 2016, the FOCUS Humanitarian (currently changed to AKAH: Agha Khan Agency for Habitat) implemented a CBFEWS, in Doshi District of Baghlan province, with technical supports from the ICIMOD. The system was established as a pilot project to showcase a low-cost and "human-centred technology" for further replication throughout the country.[44] The system is equipped with Wireless Water Level Monitoring System (WWLMS) which allows the transmission of flood signal to the receiver using wireless technology. The receiver interprets the received information and generates an alarm in three levels that are indicated with yellow, orange and red LED lights and two different types of sirens for orange and red level. Upon the generation of a siren, the care-taker will inform the downstream communities who are at risk.[45]

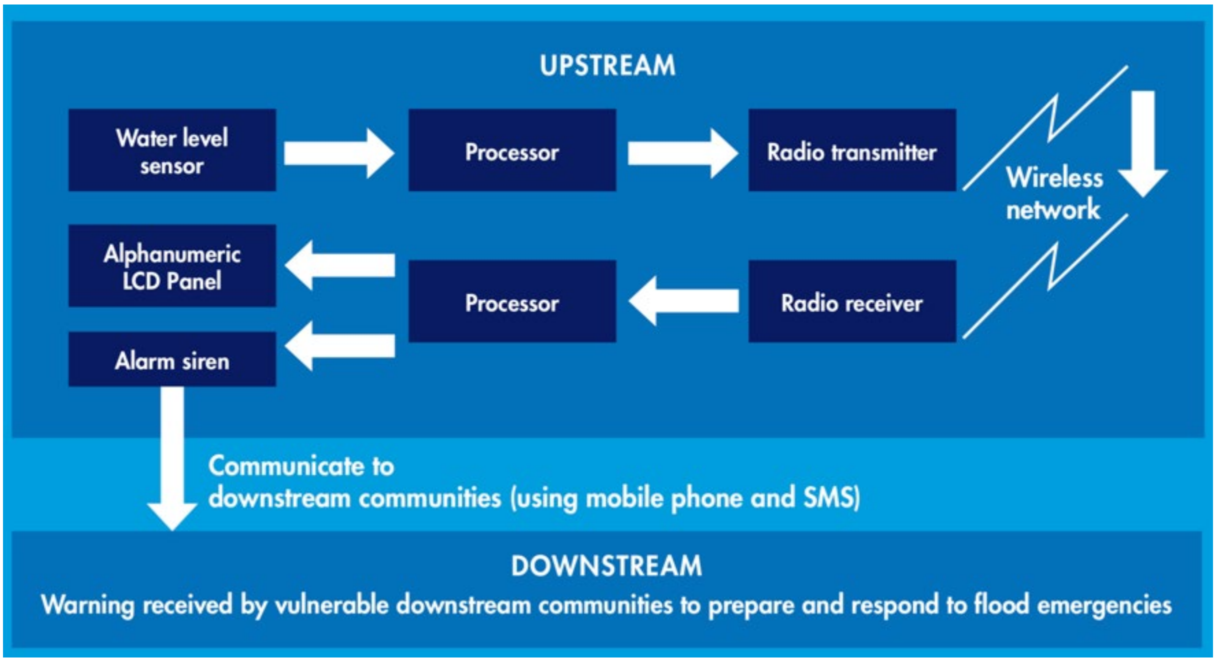

Figure 14: The infographic shows the information flow of CBFEWS implemented in Baghlan. Source: ICIMOD, 2016

Two more CBFEWS are implemented by AKAH in collaboration with NWARA, in Paryan and Peshghor districts of Panjsher Province, following a Glacial Lake Outburst Flood (GLOF) incident in 2018. Both CBFEWS are implemented recently and will be tested in mid-2021.[46] The recent CBFEWS are equipped with Telemetry-based Water Level Monitoring System (TWLMS), that provides near real-time data through wireless and cellular technology. The system is consist of three unites that include: the Data Acquisition (DA) unit, the Data Upload (DU) unit and the Alarm Unit (AU). Installed in the riverbank, the DA unit, through its contactless technology,

44. (ICIMOD, 2019)
45. (ICIMOD, 2016)
46. (Muradi, 2020)

monitors the water level and transmits the information to the DU wirelessly every 5 minutes. The DU processes the received data to generate warnings and then upload the data to the remote server via a cellular data connection. DU also sends warning messages through SMS and emails for further dissemination, if the water level reached the configured threshold. The AU is activated by receiving a worded SMS message and generates loud siren for the dissemination of early warning.[47]

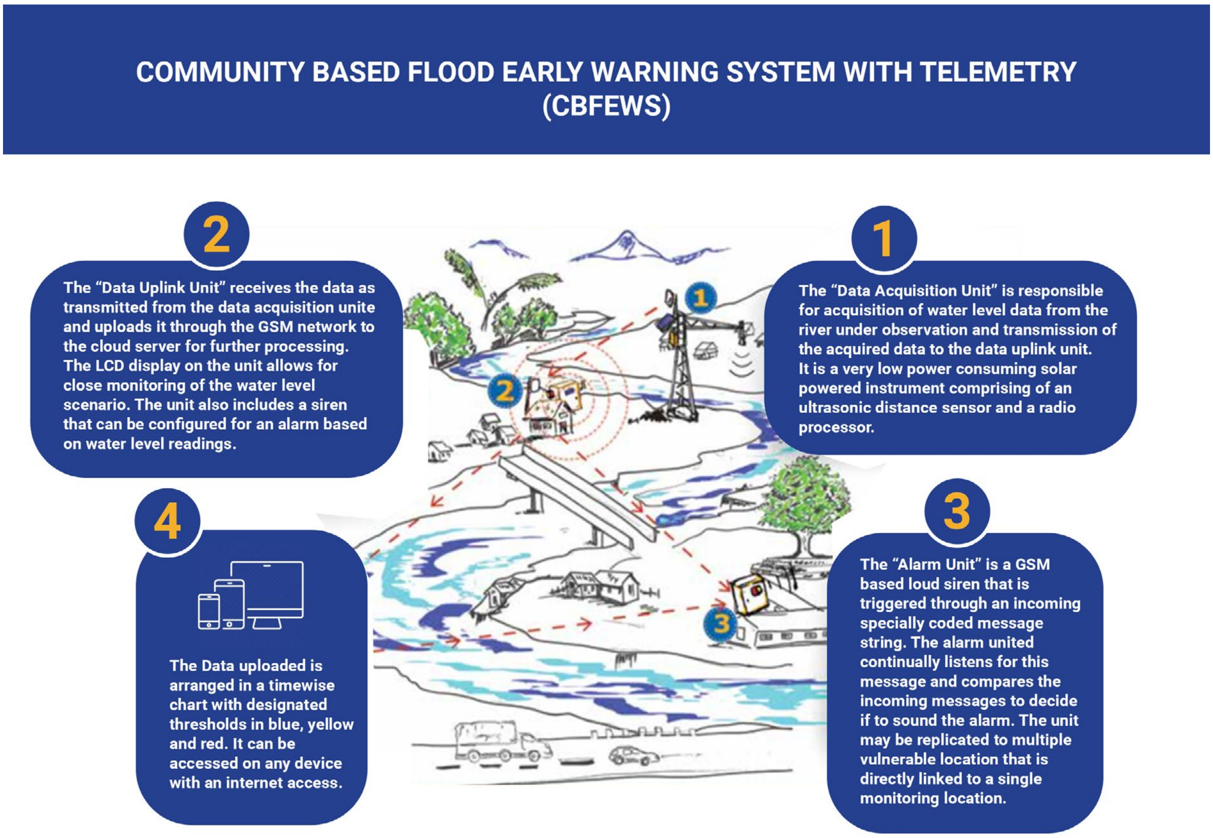

Figure 15: Infographic explains the concept of CBFEWS with Telemetry. Source: ICIMOD, 2019

All three systems are people-centred FEWS, in which communities are involved from the initial steps. CBEWS, which cover smaller landscapes, are proven to be more efficient than the systems at the national level.

[47]. (ICIMOD, 2019)

- **Upgrade of Existing Hydrological Stations for EWS**

In 2018, NWARA signed an MoU with AKAH, based on which three hydrological stations of NWARA were upgraded with hydrometeorological sensors in Shughnan, Maimai and Nusai districts of Badakhshan province.[48] This intervention was made to incorporate EWS in the existing hydrological stations of NWARA. The upgraded stations are now able to provide data on parameters, that include; water level, air temperature, wind speed and direction, water conductivity, water salinity, total dissolved solid materials, pressure, precipitation intensity and accumulation, and air relative humidity.[49] The stations are also equipped with cloud-based data transmission technology, which is accessible by NWARA officials. The technology provides real-time data, to allow NWARA for on-time flood forecast and issue warnings to the concerned communities.

- **Installation of Automatic Weather Station for EWS**

In addition to the previous initiatives, AKAH has also installed seven Automatic Weather Stations (AWS) in Bamyan province (5 AWS) and in Takhar province (2 AWS). The technology model that is used for these stations is called Davis Vantage Pro 2. The installed AWS stations provide data for parameters that include; rain gauge, temperature, wind speed and direction, and humidity. The system also has the ability of 24-hour forecasting. The responsible person can read that at the site. The data is also transmitted to the cloud server, which can be then accessed through a dedicated login account. The data is accessible only to AKAH staff, that is shared then by them with AMD, NWARA and ANDMA as per need.[50] Upon the reception of data, experts at AKAH analyse the situation, and issue warnings to the concerned communities and inform the relevant governmental entities, if needed.

An assessment of the current status of EWS based on its key elements is presented below.

3.3.2. RISK KNOWLEDGE

The development of an effective EWS requires accurate knowledge and understanding of existing and potential risks. A better understanding of risk scenarios allows estimating the potential impacts of hazards on vulnerable communities and ecosystems.

- **Practice and Capacity in Risk Knowledge**

Efforts have been made by the governmental and non-governmental organisations, for better understanding of the existing and potential risks of natural hazards throughout the country. ANDMA as the nodal organisation for disaster management has recently published an Atlas of Natural Hazards, which maps different natural hazards, including the flood, avalanche, landslide, and earthquake at the provincial level, covering all provinces of the country. This atlas allows users to better understand the vulnerable provinces to different natural hazards.

iMMAP has also been supporting the GIRoA and other national and international organisations in natural hazards mapping. iMMAP established the Afghanistan Spatial Data Centre (ASDC), recently changed its name to Afghanistan Natural Hazards Data Centre (ANHDC), which is a web-based geospatial platform and provides important information on DRR to all humanitarian organisations and governmental entities. The platform has been handed over to ANDMA. iMMAP has also been working on methodologies that allow running improved models for better estimation of natural disaster and their associated impacts on the population.[51]

World Bank has also conducted a comprehensive multi-hazard risk assessment at the national level, which also includes in-depth assessments of natural hazards for selected geographic locations. Natural hazards including flood, flash flood, drought, avalanche, earthquake and landslide are covered in this assessment. It also includes asset and exposure modellings. This assessment which is conducted in cooperation with ANDMA, MRRD, MAIL, and NWARA,

[48]. (Azizi, 2020)
[49]. (Zaheer & Rahmani, 2020)
[50]. (Zaheer & Rahmani, 2020)
[51]. (iMMAP, 2020)

provides a nationwide overview of natural hazards' risks, which can be used for risk reduction interventions by different involved organisations.[52]

In addition, other international and national NGOs have conducted risk and vulnerability assessments at the local level, as part of different environmental, DRR and development projects. Among them, AKAH has extensive experience in the establishment of CBFEWS and risk knowledge. The organisation conducts Hazard Vulnerability Risk Assessment in targeted communities and develops Village Disaster Management Plan and natural hazard maps for each of the targeted communities.

■ Major Challenges Against Risk Knowledge

Despite the multidimensional development in the area of DRR during recent years, significant challenges remain that restrain the process to better understand the existing natural hazards and their associated risks. Some of the major challenges to be addressed in future are briefly presented below:

Insecurity: Insecurity in the majority parts of the country remains as the most significant challenge for all elements of an EWS. Currently, most of the hazard maps rely on remote sensing products, which does not include on-the-ground data and information due to inaccessibility to the remote and insecure areas. Insecurity will not be repeated as a challenge in the following sections.

Data Scarcity: A better understanding of hazards and their potential future risks require quality data. Lack of data due to insecurity, low technical and technological capacity and financials issues, is one of the major challenges for risk knowledge. In addition to satellite imageries and GIS data, multidimensional and on-the-ground data is essential for better projecting the impacts of potential risks.

Hazard Variability: Variability in the nature of hazards is another challenge that is observed, with influence from different factors that includes natural and human interventions, such as the climate change impacts. This phenomenon poses a barrier for better understanding of impacts and risks that a natural disaster could cause.

Risk Knowledge Scale: The current knowledge of risks remains at a larger scale, which cannot support an efficient EWS. For an efficient EWS, it is crucial to understand the impacts of a risk at the local level. Risks assessments and analysis are needed to be undertaken at the local level, for a better understanding of the potential impacts that could be imposed by a risk.

Weak Participatory Risk Assessment: For acquiring a better knowledge of the impacts of a risk, it is important to undertake inclusive risks assessments, where the community people are involved in the process. A people-centred and participatory risk assessment will not only support the data collection process but also allow to integrate traditional knowledge in the process.

Lack of Enough Financial Resources: The country also lacks enough financial resources to improve the current status of EWS and to cover the hazard-prone areas with the network of people-centred EWS.

52. (World Bank, 2018)

3.3.3. MONITORING AND WARNING SERVICES

Monitoring and warning services is another critical element of an EWS. This element is the foundation for observing and monitoring various sets of parameters which helps us issue warnings about potential future risks. In order to appropriately respond to potential natural hazards, it is essential to have continuous monitoring of the associated risks and provide on-time warnings to the vulnerable communities.

- **Current State of Monitoring and Warning Services**

In Afghanistan, the responsibility for flood risk monitoring is divided between AMD and NWARA. Forecasting flash flood is the purview of AMD, while NWARA is responsible for forecasting the riverain floods in the country. Both of these institutions, using their operated monitoring stations and remote sensing products, monitor potential risks and issue warnings through their respective webpages and social media platforms. The forecast experts decide the threshold for different levels of risk in each entity.

In addition to AMD and NWARA, MAIL also has a number of agrometeorological stations, which collect data for agriculture and irrigation purposes. At the local level, in some CDCs the CERT teams have been established, some of whom are equipped with basic weather monitoring equipment. They also monitor the weather conditions, especially during winter and raining seasons, and issues warning to the relevant communities.

AMD owns around 25 active synoptic stations (SYNOP) installed throughout the country, which operate manually. According to AMD, Afghanistan needs around 50 SYNOP stations to provide adequate coverage for weather monitoring throughout the country. Based on an agreement, NWARA has allocated around 26 Automatic Weather Stations (AWS) stations to AMD, of which eight stations are handed-over to AMD until now. Upon the completion of the hand-over process, AMD will be operating around 51 weather monitoring stations.[53]

AMD has also access to some global centres for data observation. As part of the global project of the World Meteorological Organization, AMD has access to the Flash Flood Guidance System (FFGS).[54] FFGS is an important tool that provides 6-hours real-time informational guidance on small-scale flash flood for operational forecasters. AMD also has access to METCAP+ system that is developed by Turkey's State Meteorological Service. Furthermore, the department has access to satellite data through the EUMETCast system of Meteosat-8.

Currently, AMD provides a three-day weather forecast for several cities and hazard's warnings at the provincial levels throughout the country. However, the warnings and forecasts do not include any information on the potential impacts of hazards, that supports information users in decision making. AMD has set three levels of warnings (Yellow, Orange and Red). Flash floods are forecasted relying on the available data from the monitoring stations, the above-mentioned global systems and the hazard maps, with no analysis of on-the-ground information on the absorption capacity of the soil, which is crucial for flash flood forecast.

NWARA owns 125 hydrological stations and 30 Automatic Weather Stations (AWSs) with snow-monitoring capabilities. These stations do not include the 26 AWSs transferred to AMD, which are not equipped with snow-monitoring equipment. NWARA has equipment for more hydrological stations that are not yet installed due to security concerns. The hydrological stations of NWARA collect data on precipitation, water level, air temperature, and relative humidity, while the 30 AWSs collect data on precipitation, relative humidity, temperature, wind speed and direction, pressure, solar radiation, and snow depth. Parameters under the hydrological stations are observed every 15 minutes, while the ones under AWSs are observed every 30 minutes. Figure 14 shows the hydrological monitoring stations coverage that are operated by NWARA.

---

53. (World Bank, 2018)
54. (Muradi, 2020)

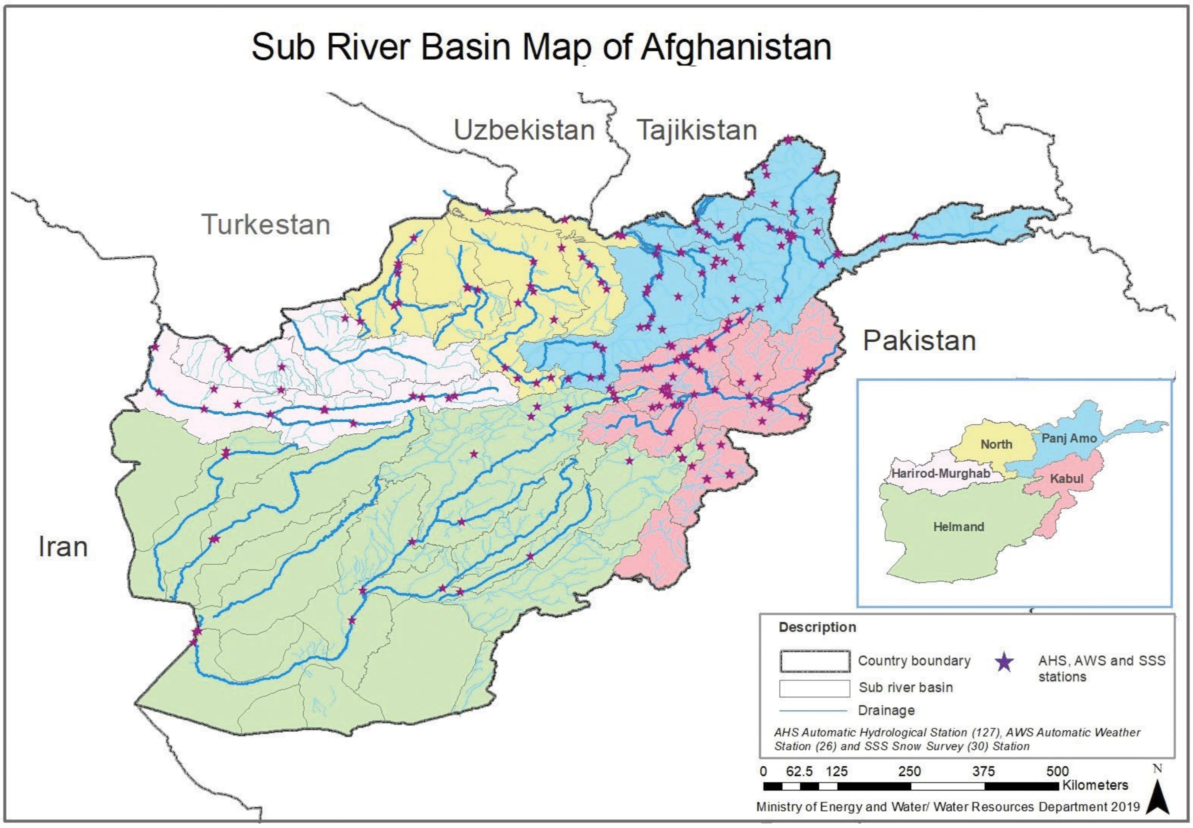

Figure 16 Hydrological Network Operated by NWARA[55]

NWARA used to have access to the telemetry system which allowed to transfer data from the stations to the HQ through Iridium satellite. Since the contract for this system was not extended, the telemetry system is disconnected since 2016. However, recently three hydrological stations of NWARA were upgraded by AKAH which has cloud-based data transmission facility. In addition, the newly established CBFEWS in Panjsher and Baghlan provinces are also equipped with telemetry and wireless systems that allow wireless transmission of data to the HQ.

As mentioned earlier, NWARA is responsible for forecasting river flood in the country. The existing operating procedure for the river flood forecast starts from the gauge men observations of the water level at the stations installed along river and sub-river basins. On daily basis, the NWARA gauge men collect the data two times from river. In special occasions when there is a sudden increase in river water level, the gauge man collects the data and share it with the HQ in Kabul. The experts of the NWARA review the data and compare it with historical data of the same river and decides about the warning threshold level considering the weather forecast and geographical local of the area. An example of the issued warning by NWARA is provided in figure 15 below:

55. (NEPA, 2019)

نقشه ساحات تحت تهدید و احتمال وقوع سیلاب در حوزه های دریائی کشور(از تاریخ 22 الی 25 ماه ثور 1399)

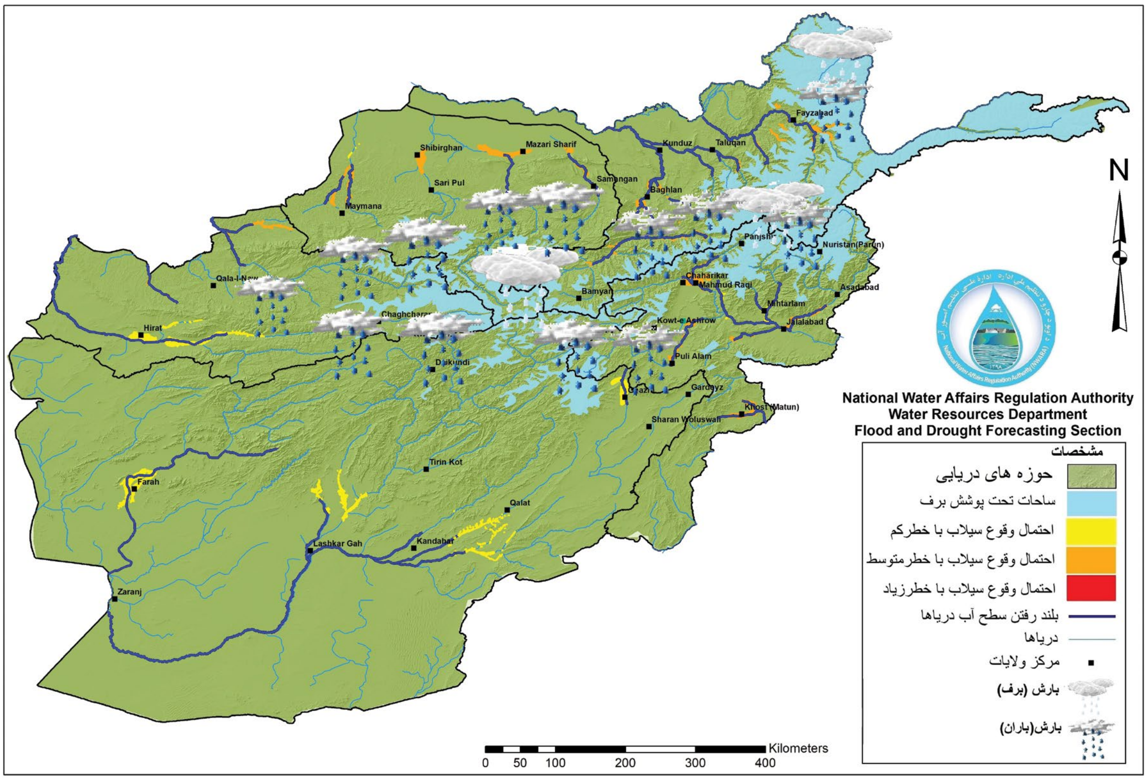

Figure 17: Sample of NWARA issued warning.[56]

Currently, the impact threshold for each level of risk is set by the judgement of forecast experts in AMD and NWARA. Both entities issues warnings on flood and flash flood through their respective webpages and social media accounts. ANDMA, who currently, has a dissemination role for issued warnings, has been monitoring the webpages and social media accounts of NWARA and AMD. ANDMA envisages receiving forecast data from both NWARA and AMD, and issues warning based on analysis of the date that is done in ANDMA's HQ. Recently an MoU was signed for this purpose between ANDMA and AMD, based on which AMD shares forecast data with ANDMA, and ANDMA issues warning after analysing the provided data.[57]

At the local level, is some communities, the established CERT teams and other locally mobilised teams continuously monitor hazards and its associated risks at the community level. AKAH has trained more than 750 CDCs on EWS and established CERT, SERT, and AVPT teams in seven provinces. AKAH has also established three CBFEWSs equipped with monitoring stations in Panjsher and Baghlan provinces and installed 7 AWS in Bamyan and Takhar provinces, which continuously monitor different parameters that could support flood forecast and warning issuances. AKAH has also established 15 WMPs in Badakhshan, Takhar and Baghlan provinces. These WMPs are established as a local EWS for avalanches, but they are also used to gauge precipitation and other weather monitoring parameters, that could support flood forecasts.

Experts at the HQ of AKAH receives collected data by WMPs and other AWS, and issues warnings after analysing the data and comparing it with other global data sources to which they have access. Depending on its criticality, they share the warnings and data with AMD, NWARA and ANDMA as well.

[56]. (WRD, 2020)
[57]. (Samim, 2020)

In some communities, natural hazards have been monitoring using the traditional knowledge of the experienced elders of the communities. This is one of the prevalent and practical methods in remote areas of the country where the aged people play an essential role in monitoring potential natural hazards and issuance of warnings.

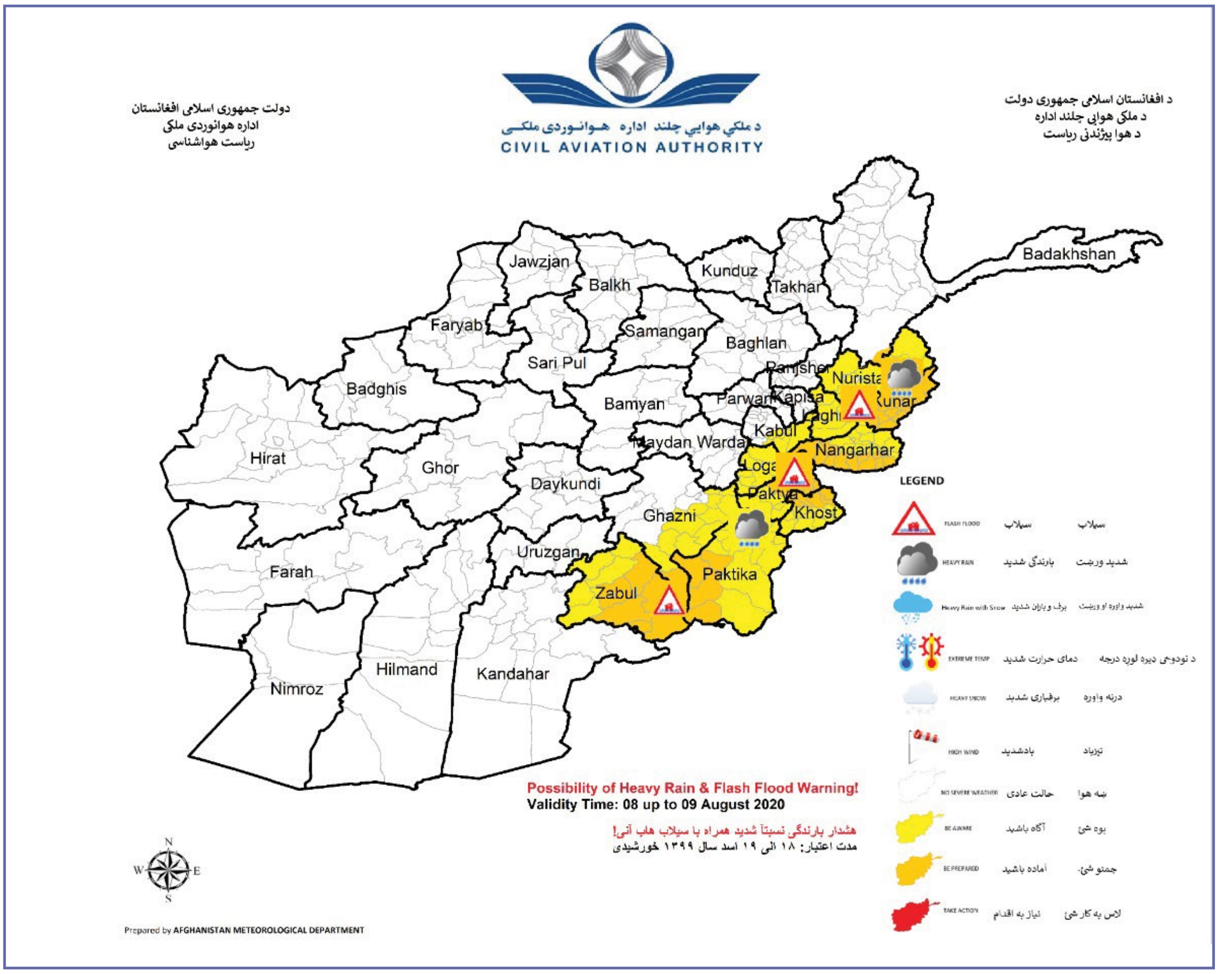

Figure 18: Sample of AMD›s issued forecast and warning.[58]

- **Major Challenges in Monitoring and Warning Services**

While different governmental and non-governmental organisations have made efforts to improve the hydrometeorological monitoring services in Afghanistan, many significant challenges still exist that harness the efficiency of the services. These challenges are briefly presented below:

Insufficient Monitoring Coverage Area: The existing stations for hydrological and meteorological monitoring services are not enough to provide adequate coverage for the whole country. This issue is much more significant in the case of weather monitoring services. AMD has identified a need for 50 SYNOP stations to cover the whole country. Though it is reported that hydrological monitoring network covers adequately many parts of the country, some coverage gaps remain for some parts of the country. Insecurity and inaccessibility to these areas are reported to be the main reasons for the coverage gap.[59]

[58]. (AMD, 2020)
[59]. (World Bank, 2018)

Inadequate Data Transfer Technologies: Data from the hydrological and meteorological stations are transferred to HQ manually. A radio transmitter, transfer the data from AMD's stations to the HQ using radio or mobile phone on daily- or six hour-basis. Hydrological stations are also disconnected with the telemetry system since 2016, except for three stations in Badakhshan and three CBFEWS in Baghlan and Panjsher provinces. Therefore, the data transfer for hydrological stations is also done manually. Absence of real-time data transfer remains as a major challenge, that compromises the efficiency of the EWS.

Weak Data Management: It is crucial to develop an efficient data management system, that ensures data quality assurance, data archiving and data sharing processes. Quality control and assurance (QA/QC) and access to available data remain as critical challenges for the data management processes. There have been previous and ongoing efforts to improve the data management in AMD, NWARA and MAIL. However, there is still potential for further improvement in this regard.

Inadequate Institutional Arrangement: In the current institutional arrangements, AMD and NWARA forecast floods and flash floods and issue warnings accordingly, while the dissemination of warning falls under the responsibilities of ANDMA. However, ANDMA, who has the on-the-ground risk and vulnerability knowledge, is not involved in deciding on warning thresholds. This division of responsibilities causes complexity in the process of monitoring of risks and declaring warnings. Given that the risk and vulnerability knowledge is with ANDMA and the forecast and monitoring abilities are with NWARA and AMD, there is a need for joint efforts on deciding on flood and flash flood warning thresholds. Currently, there is no clear mechanism for coordination on the EWS except for the recently established EWS committee.

Insufficient Technical Capacity: Establishment of a professional and technical workforce is a major challenge for AMD, NWARA, ANDMA and other stakeholders. To enable the country to move in parallel with the globe, investment is much needed on importing new technologies and building the capacities of the national experts to use and maintain these technologies.

3.3.4. DISSEMINATION AND COMMUNICATION

The third key element of an EWS is the dissemination and communication of the warnings to the endangered people. The warning messages should, one, forecast a potential future risk, second, include a clear message of what should certain people do. For disseminating the warnings, different communication means and channels should be used to ensure receiving the warning by the communities in risk. In the meantime, it is essential to warn the public early in advance to help them take action.

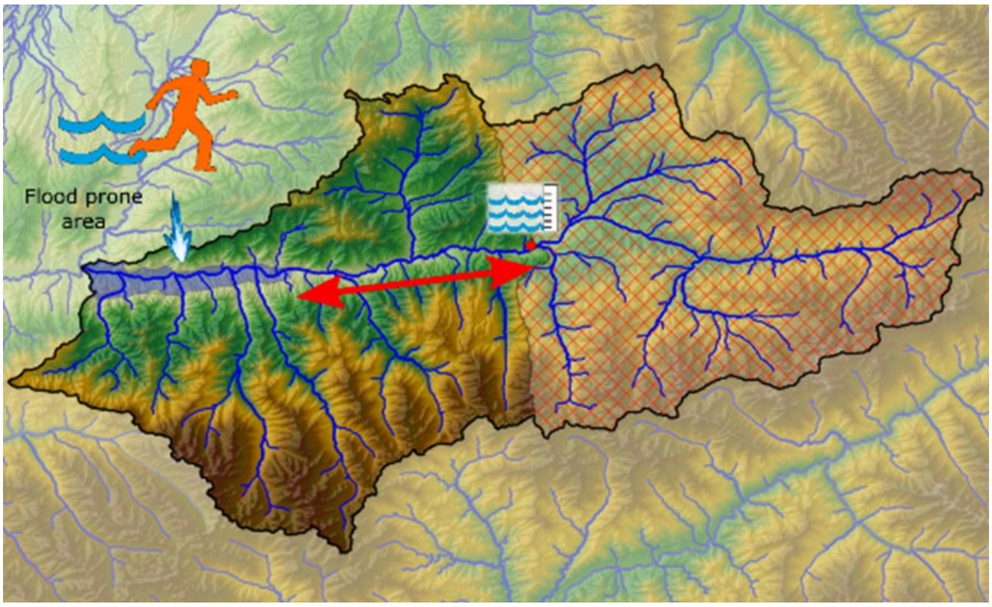

Figure 19: Sketch map of a river level gauge.[60]

[60]. (Neussner, 2020)

- **Current State of Dissemination and Communication**

Given that there is no systematic EWS and a clearly defined Standard Operation Procedure (SOP) for early warnings in Afghanistan, the issued warnings do not follow a previously defined communication way to reach to the communities at risk.

At the current arrangements, the issued warnings by AMD and NWARA are shared through their respective webpages and social media accounts, especially on their Facebook pages targeting the general public. In addition to social media, AMD shares the warnings with mass media as well for broadcasting. However, there is no formal agreement between the AMD and mass media. AMD and NWARA do not have a formal communication with ANDMA about the issued warning. Once a warning is issued, ANDMA has to find it out and share it forward. Recently, after the incident of the flash flood in August 2020, in Parwan province, AMD, NWARA, ANDMA and other relevant institutions have created an "unofficial" WhatsApp group, through which they communicate the forecasted risks between themselves.[61]

Upon the reception of warnings, ANDMA informs their provincial directors to get ready for any emergency, also to share the warnings with PGOs and other relevant provincial departments. At present, ANDMA's role is just coordinating the emergency response processes when a hazard happens.

Given that flood and flash flood are not forecasted at the community or district levels, ANDMA staff at the provincial level relies on the risk history of each community and hazard maps, for identification of vulnerable districts and communities. Based on the feedbacks by their staffs during the consultation workshops, in some cases, the Directorate of Hajj and Religious Affairs at the provincial level also played a key role in disseminating the warnings to the communities at risk. To the date of writing this report, no assessment was undertaken to evaluate the effectiveness of the issued warnings and the process being followed.

As per the information provided by ANDMA, the Afghanistan Telecom Regulatory Authority (ATRA) has also been working on developing a National Emergency Telecommunication Plan for Afghanistan, which aims to support the dissemination process of the early warnings using telecommunication means.[62]

For the community-based flood early warning systems, community members are involved in the dissemination of the warning. Upon the declaration of warning by forecast experts at NWARA or AKAH, the responsible person will be informed for further dissemination of the warning. Usually, they inform the community members using either the loudspeakers of the mosques or the previously donated to them for this particular purpose. Historically, in Afghanistan, different means have been used for disseminating warnings such as playing Dhols, shooting bullets, or shouting louder. Some of these means of communication are still used in some remote areas which should be considered as a traditional and practical knowledge at the local level.

For the recently established CBFEWS, the system itself is equipped with sirens that are triggered if the water level reaches or passes the adjusted threshold. The sirens are installed close to the residential areas, in case some people did not hear the alarm; it is the care-taker who informs the community members using hand-carry loudspeaker or any other communication mean.

---

[61]. (Muradi, [62](2020.
[62]. (Samim, 2020)

- Major Challenges in Dissemination and Communication

Despite the efforts made by various governmental and non-governmental organisations, warning messages do not reach to all communities at risk. Some of the major challenges for the dissemination of warnings to community members are briefly described as bellow.

Inadequate Institutional Arrangements: For disseminating the warnings to people at risk, lack of clear roles and responsibilities between the line ministries and agencies remains a big gap. This was already discussed in the previous sections.

Lack of Clarity in Warning Messages and Inaccuracy: The issued warning by NWARA and AMD lacks impact information about the risk and instructions for users to support them in taking action. On the other hand, since AMD and NWARA do not have information about the risk factors on the ground, the warning threshold level is always a question. This gap leads to a considerable intensification in the inaccuracy of warnings. Dissemination of unclear warning messages decreases the value of warning and is associated with the risk of being ignored by communities and people.

Low Media Engagement: Mass media play an important role in the dissemination of information. However, based on AMD, the recognised private media channels are less interested in the dissemination of early warning messages.

Inadequate Mobile Communication Courage Area: The courage area of mobile networks has always been a challenge in Afghanistan. Despite extraordinary progress in this sector since 2002, only 90 % of the total population of the country has access to mobile phones.[63] However, due to the insecurity and instability, there is no operation of the mobile networks, particularly during the night time. This cut-off cost a lot some times for the residents of such areas.

No Assessment of Previous Early Warnings: There is no assessment undertaken to identify the effectiveness of the issued warnings. Currently, no lessons-learned are captured from the dissemination of warnings and its effectiveness. A formal feedback process could support to improve the current state of the EWS and its accuracy in the country.

Short Notice Time: Basically, a FEWS detects a flooding condition upstream and warns inhabitants downstream of the impending flood. The longer the time between the warning and the actual arrival of the flood, the better the residents can prepare by bringing their belongings and themselves to safe places or take other precautions.

3.3.5. RESPONSE CAPABILITY

Response to early warnings includes the activation of the coping mechanisms before a disaster happens.[64] This includes the preparedness strategies and plans of the communities at risk. For an effective EWS, the concerned communities must possess a functional response capacity. It usually takes some time to bring certain items to safety or protect them otherwise. This depends much on the circumstances of the location (e.g. proximity of a safe place). As a guideline, some examples are listed here.

Table 3: Items Protected with Warning[65]

<30 min warning	<2 hours warning	<4 hours warning	>4 hours warning
Small electric appliances	Items in cupboards	Large appliances (e.g. refrigerator)	Big oven, freezer
Essential clothing	Expensive clothing	Additional clothing and personal effects	Large amounts of harvest
Small electrical appliances	Small stove, toaster	Bookcases, dining tables, chairs, carpets	Beds, big cabinets
Personal effects	Vehicles	Livestock (e.g. Chicken, cows)	

63. (ATRA, 2020).
64. (United Nations, 2006)
65. (Neussner, 2020)

- **Current State of Response Capacity**

With the warning declaration, different institutions that are involved in disaster preparedness at the national and local level are triggered for coordinating their preparedness and emergency plans, including the community that is threatened by the risk. Therefore, hazard warnings must come from reliable sources and include explicit instruction that allows individuals to take appropriate actions. Preparedness and response plans for hazard warning are always associated with an efficient EWS.

With the absence of a systematic EWS and standard operation procedure at the national level, the current response plans and strategies focus on post-disaster emergencies. There are potential governmental and non-governmental institutions that could support response strategies at the national and local levels before disaster strikes. However, this requires the development of EWS methodology by ANDMA, and proper training and outreach on the process.

- **Major Challenges in Response Capacity**

At the national level, EWS is limited to the forecast, issuance of warning and dissemination of the issued warning. The country lacks an extensive plan for response to the issued warnings. Based on the three levels of risk, the action required is limited to: No Action, Be Prepared and Take Action (or Evacuation). Some of the major challenges for an adequate response capacity to issued warnings are briefly presented below.

Lack of a Response Plan: The country lacks a response plan for the issued warnings. Currently, no SOP is developed for EWS at the national level, and the issued warnings also do not provide adequate information on the action required.

Inadequate and Unclear Warning Messages: Inadequate and unclear warning messages remain as key challenges against enhancing the response capability. The current forecasts and warnings do not include information on the impact of the risks and guidance of what should a particular community or group do, when and how.

Untargeted Warnings: Issued warnings remain at the provincial scale in terms of geographical area. They are not tailored for the people or communities at risk. For a province with more than 100 thousands of population, it is not clear who should respond to the issued warning. In most cases, people may assume that the issued warnings are irrelevant to them. Therefore, untargeted warning messages remains as a challenge for the respond capacity process.

Lack of Institutional Arrangement: The current institutional arrangement throughout the country is mostly engaged with post-disaster response interventions. Coordination among the different organisations is not yet established to support response interventions to early warnings. However, the national and provincial disaster management commissions are able to intervene if needed, for the community›s response to warnings issued.

Lack of Proper Evacuation Centres: Based on Afghanistan Living Condition Survey (ALCS), over 54 per cent population of the country was living under the poverty line. This means that the socio-economic situation of the Afghan people do not permit them to evacuate from their houses unless there are some safe, secure and equipped evacuation centres, where they can find a safe place and food for their families. Currently, only some communities have equipped evacuation centres. In some remote areas, particularly in Badakhshan province, during the winter season, they go to their relatives› houses to be safe from avalanche risks.

3.3.6. CONCLUSION AND RECOMMENDATIONS

Afghanistan lacks a systematic and defined EWS at the national level. The adopted frameworks are developed in line with global agreements and national priorities, and most of these frameworks consider EWS as a significant need for DRR in Afghanistan. Based on the law, ANDMA is responsible for all pre- during and post- stages of disaster risk reduction and management in the country. However, responsibilities for different elements of an effective EWS is divided between various institutions in Afghanistan. As per a recent presidential decree, a National Early Warning Committee is established, which is led by the National Statistic and Information Authority (NSIA).

In the current arrangements, ANDMA with its historical data is considered as the central entity for Risk Knowledge. Risk Monitoring and Warning Services are done by AMD, NWARA for flood and flash floods. Both organisations operate hydrometeorological stations and have access to global platforms. Using their available resources, AMD forecasts and issue warnings about flash floods while NWARA is responsible for observing and issuing warnings about the river floods. ANDMA is responsible for Warning Dissemination, through its provincial directorates and other governmental organisations. Warnings are also reached out to people through AMD and WRD's websites and social media platforms and sometimes through mass media channels. Given that the country lacks a systematic EWS and its associated SOP at the national level, to date, there are no or feeble efforts made for response plans to issued warnings. At the local levels, however, NWARA with supports from AKAH has established three CBFEWS.

It is obvious that a community-based early warning system is much more effective than a system at the national level. Focusing on community-based (People-centered) EWS is also in line with the existing DRR frameworks of Afghanistan.

During the past two decades, a significant amount of efforts are made in the field of DRR. Today, the GIRoA, with support from its national and international partners, has a better knowledge of natural hazards and its relevant risks, than ever. Though further improvements are needed, the government monitors different parameters associated with flood and flash floods and provides forecast and warning services. Warnings are disseminated to a bulk of people through mass media channels.

However, there is still need for further efforts to be made to improve the current state of risk knowledge to the village and watershed levels; to extend the coverage area of hydrometeorological monitoring stations; to improve forecasting and warning issuances; to strengthen the warning dissemination processes and channels, and to establish and improve an effective response plan to issued warnings.

For effective EWS, it is vital to achieve and improve all four elements. With the current institutional arrangement, each of the four elements of the EWS is achieved at the national level, in a disconnected way from each other. Coordination and continuous communication among the involved institutions need more attention and improvements. At some point, there is a need for joint and inclusive efforts to be made among the involved institutions.

The following recommendations are based on the findings of this report and are intended to address some of the existing challenges against the FEWS in Afghanistan.

- ANDMA, in collaboration with AMD and NWARA, should establish a methodology for the establishment of a FEWS and a CBFEWS supplement with a clear SOP that explains different stages for the establishment and implementation of an EWS, including the type of technologies to be used. Having clear SOPs will allow other practitioners in the sector to follow the same methodology and use the predefined and unified type of technologies.
- The current institutional arrangement requires an inclusive and consultative discussion among the involved stakeholders to clarify each institution's responsibilities and terms of references. Based on the findings of this report, a proposed structure for EWS is attached in the Annex 2.
- Communication among the involved institutions needs to be strengthened, both at the national and local levels. Stakeholders need to communicate rapidly and have shorter "wires" of communication. An efficient approach would be to rely on Information

Technology products, such as the establishment of a platform that is accessible by all key stakeholders. Effective communication among and between the stakeholders is crucial throughout the achievement of all four elements of an EWS.

- In line with the adopted frameworks of the country, the establishment of new EWS needs to be people-centred and at the same time technically sound systems that include traditional approaches and systems.
- As disaster is managed through different development and ecological plans and programmes, it is important to integrate EWS establishment in relevant national and local frameworks and action plans.
- Given that the implementation of an EWS falls under the responsibility of various institutions, coordination among the key involved institutions should be strengthened. This coordination is required throughout the achievement of all four elements of EWS. Some of the processes, such as the issuance of a warning require the involvement of more than one institution, which not only requires coordination but even joint delivery. This might require signing a Memorandum of Understanding among different institutions which are not members of the National or Provincial Disaster Management Commissions.
- Raising public awareness is key to the efficiency of the EWS. To raise awareness of the general public, it is essential to develop and deliver outreach and educational programmes at the national and sub-national levels.
- To the extent possible, efforts should be made to extend the number of CBFEWS throughout the country. If not high-technologies, basic and low-cost early warning equipment should be distributed in the most vulnerable communities.
- To overcome financial challenges, the government needs to allocate an annual budget for the improvement of the current status of the EWS as well as to extend the coverage of EWS throughout the country. The government should also focus on accessing global climate funding mechanisms, such as the GCF, GEF, AF, and many other mechanisms, for this purpose.
- The government should also maintain and improve its collaboration with their relevant international partners to benefit from their technical and technological assistance.
- To have a better knowledge of flood risks:
    - Risk and vulnerability assessments need to be undertaken at the village and watershed levels, in order to allow better monitoring of risks, which will result in issuing accurate warnings and disseminating to the communities at risk;
    - Strengthen the data management system on risk knowledge. Risk and vulnerability assessment conducted by various organisations using on-the-ground surveys or through remote sensing approaches, need to be stored in a central data repository for further analysis and uses. The system should ensure quality assurance and quality control procedures.
    - Risk and vulnerability assessments need to be conducted in an inclusive, participatory and community-based manner, in order to involve all stakeholders and capture traditional knowledge for risk management.

- To overcome the risk monitoring and warning services challenges:
  - The current monitoring station networks should be extended to cover all vulnerable areas of the country. However, in case the plan is to bring new technology, the feasibility study of the concerned technology should be undertaken to avoid functionality failure at later stages as it is evident in some cases;
  - Monitoring stations need to be equipped with telemetry and other adequate technologies that facilitate real-time data transfer. This will allow enough lead-time for the people at risk to get to a safe location, in case of flood and flash flood risks.

The current institutional arrangements between ANDMA, AMD and NWARA need to be reviewed, an ideal situation would be to decide on the warning levels jointly. For this purpose, all three institutions need to compare their data and conduct a joint analysis of data for warning issuance.

  - Risk levels threshold needs to be adjusted according to the vulnerability level of each location. On-the-ground risk and vulnerability data for deciding on warning levels and adjusting the threshold is fundamental beside monitoring and forecasting of other hydrometeorological parameters.
  - A capacity needs assessment should be undertaken to identify the capacity need for the relevant institutions, to improve the risk monitoring and warning services. Informed by the mentioned assessment, capacity enhancement programmes should be planned and delivered for professional working on both risk monitoring and warning services.
- To overcome the gaps in dissemination of the warnings:
  - The issued warning messages should be very clear and include information on the risk impacts, and provide decision-making advice that could support people at risk to take action.
  - It is important to route all early warnings through a single delivery mechanism. This will allow to build trust, ensure timely dissemination of warnings and use a standard language for all messages.
  - The provincial offices of ANDMA need to be proactive for the dissemination of warnings to ensure widespread of the warnings to all concerned people and communities.
  - At the provincial level, there is a need for joint collaboration between the PDMC representatives and the CDC. This joint engagement requires an official Memorandum of Understanding or any other official binding agreement.
  - ANDMA should undertake an assessment of the effectiveness of the warning messages. This will allow evaluating the effectiveness of warnings delivered and capture the lessons-learned for further improvement of the process.
  - Efforts should be made to accelerate the development of the ATRA National Emergency Telecommunication Plan for Afghanistan.
- For overcoming the gaps in response capability:
  - The government needs to establish a standard response plan for issued warnings. Currently, there is no clear guidance for how people should react to the issued warnings and how to ensure that the targeted people react to the warnings.
  - Warning messages need to be targeted to the people and communities at risk. This will allow the message to follow a specific route to reach out to the targeted audiences and will acquire them to take action.
  - Strengthen people's knowledge on the response plans through conduction of training sessions, outreach materials and undertaking simulation exercises and drills.

Establish and strengthen coordination mechanism among different institutions that could potentially support the response plan to the warnings. This might require and official MoU among different organisations to engage on the occasions of need.

4

ANNEXES

ANNEX 1: A CASE STUDY ON A CBEWS FOR AVALANCHES AND FLASH FLOODS IN SHUGHNAN DISTRICT OF BADAKHSHAN PROVINCE

Agha Khan Agency for Habitat (AKAH) was registered under this name with MoEc in 2018. Prior to changing its name to AKAH, it was active since 1996 in Afghanistan under the name of Focus Humanitarian Assistance. It works under the umbrella of AKDN.

One of the two departments of AKAH office in Afghanistan is the Emergency Management Unit. The main focus areas of this unit include CBDRM, capacity building, awareness-raising, search and rescue, response and recovery.

The Shughnan district of Badakhshan province has been connected with standard EWS since 2017 by AKAH. To date, 56 villages out of total 59 villages of Shughnan districts are covered under the CBEWS.

Figure 20: Shughnan district ©Rahman Baik Rahmani

4.1. BACKGROUND INFORMATION ON CLIMATE-INDUCED NATURAL HAZARDS IN SHUGHNAN DISTRICT

Shughnan is one of the 28 districts of the north-eastern Badakhshan province, located 150 km to the east of its centre Faizabad city. The area of Shughnan district is 3,545.2[66] Km^2, with a total population of 31,847[67] people. Shughnan district has 59 villages, and the centre of the district is Bahshar. In this district, about 3,200 households live, out of which some 2,080 households are vulnerable from the avalanches[68]. The district is located along the Amu River. The district shares boarders in the east with Amu River, in the west with Arghanjkhwah and Darwaz-e-Bala districts, in the north with Darwaz-e-Bala district and Amu River, and in the south with Ishakishim and Shohada districts. Shughni is the native language of the district residents.

66. (IDLG, 2020)
67. (NSIA, 2020)
68. (AKAH, 2020)

Due to its high mountains and impassable geography, especially in winter, when it snows, almost all transportation routes in the district are closed, which causes many difficulties for its people. The district has short, relatively hot and dry summers and very harsh and long winters. The average annum precipitation in this district is about 480 mm, mainly snow. The cold Siberian cold waves have specific impacts on this district.

Most of the Shughnan district residents live in the lopes of high mountains, which put them at a higher risk of climate-induced natural disasters such as avalanches and landslides as well as floods. Out of the 59 villages of the Shughnan district, about 35 people from CDCs were surveyed for this study.

As a result of the survey, avalanche and landslide were found to be the two major natural disasters, followed by floods and flash floods. On average, in every village, the frequency of avalanches is over four incidents/year, which causes losses of lives and properties. At the same time, the average flood incidents are 2/year. However, at the district level, the ratio of the frequency of flood and avalanche is 1-3/5-10 per annum.

In Shughnan district, about 9.76 k people and 736 Km^2 area have been identified as prone to avalanche.

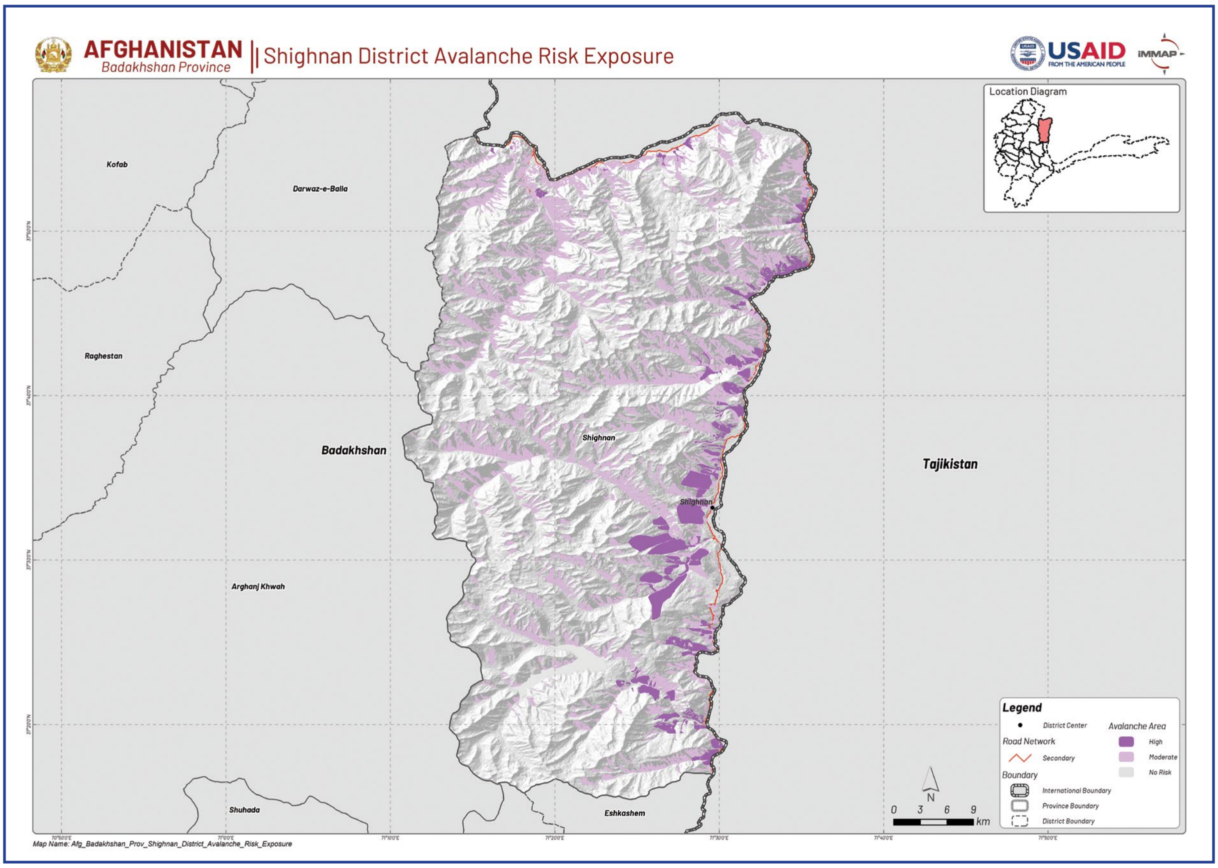

Figure 21: Avalanche-Prone Area Map of Shughnan District.[69]

[69]. (iMMAP, 2020)

Flood being one of the moderate risks to the residents of Shughnan district, threaten 5k people and 113 Km² Area of Shughnan district.

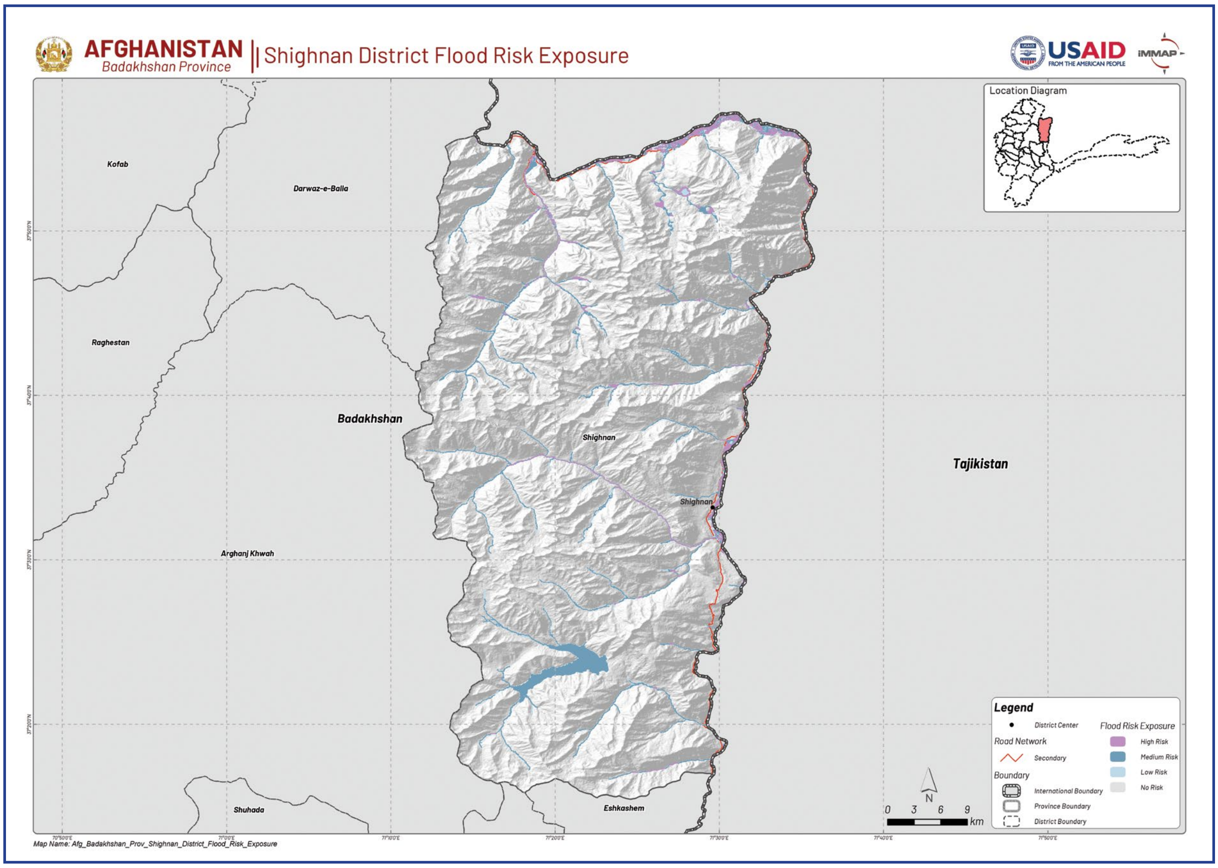

Figure 22: Flood-Prone Area Map of Shughnan District.[70]

The statistics of avalanche and flood are provided in figures 19 and 20 below.

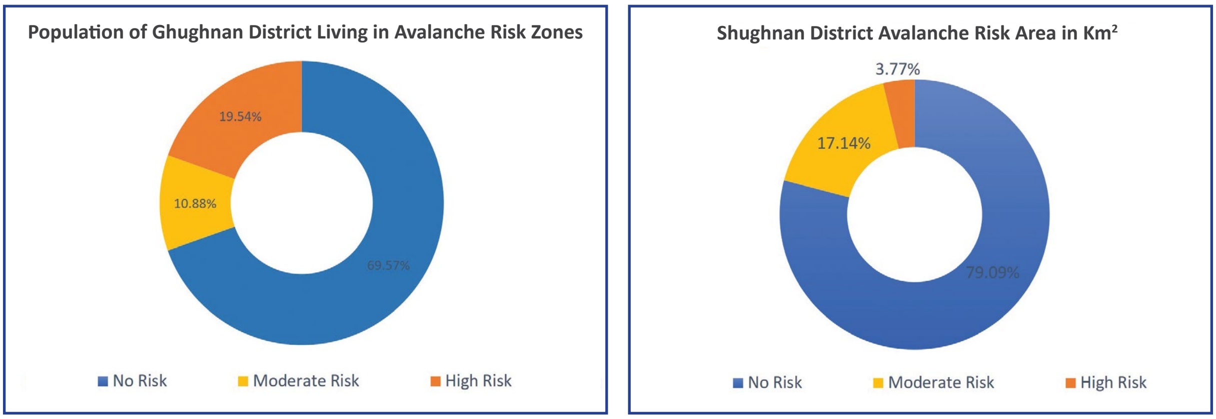

Figure 23: Shughnan District Avalanche-Prone Population and Area.[71]

---

[70]. (iMMAP, 2020)
[71]. (iMMAP, 2020)

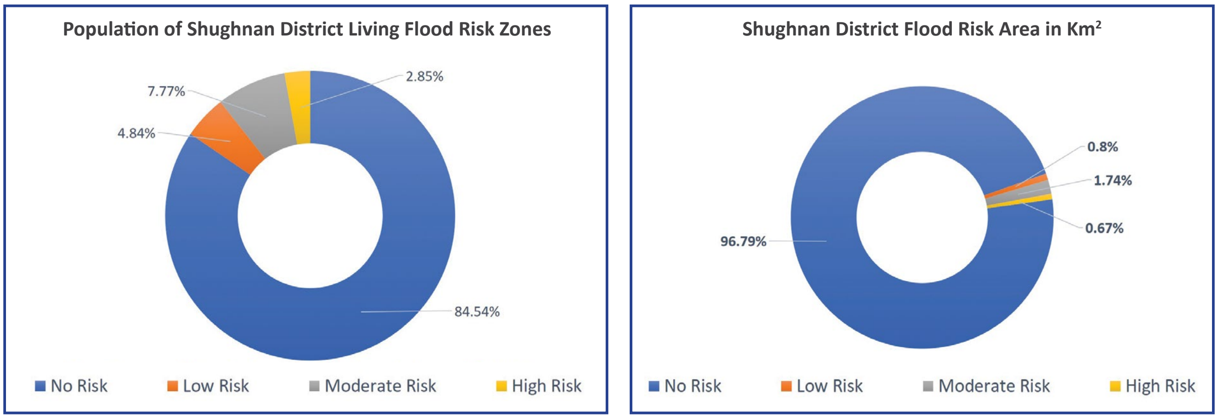

Figure 24: Shughnan District Flood-Prone Population and Area.[72]

Figure 25: An avalanche in Dehshar Area of Shughnan district ©Rahman Baik Rahmani

A summary of the historical avalanche and flood incidents in Shughnan district is provided in the table three below:

[72].(iMMAP, 2020)

Table 4: Summary of the historical climate-induced natural disaster events in Shughnan district

#	Type of Disaster	Year	Losses and Damages			
			Loss of Lives	Loss of Agricultural land	Loss of Livestock	Loss and Damages of Properties
1	Avalanche in Badam Area	1945	1	12 Ha	No record available	1 Ha pasture 300 m irrigation canal
2	Avalanche in Badam Area	1985	0	7 Ha	100 sheep and goats	9 houses 250 m canals 2 Ha pasture
3	Flood in Amu River	2010	0	3 Ha	11 sheep	1,500 trees 1 Km road
4	Flood from Koh-e-Safid Area	2012	0	5 Ha	20 sheep and goats	Main irrigation canal of Badam, Tandir and Nimdah areas. 500 trees
5	Flood from Badam Area	2012	0	4 Ha	0	4 houses 15 Gardens 30 m irrigation canal 40 m main road
6	Flood from Bawar Dara	2014	0	677 Ha	0	120 m main irrigation canal 4 drinking water reservoirs 3 main bridges 7 small hydropower plants 17 watermills

Note: This data is compiled from the field visits and meetings with the elders of the communities who have remembered. There might be other events aw well for which the data was not accessible at the time of preparing this report.

4.2. INTRODUCTION TO COMMUNITY-BASED EARLY WARNING SYSTEM IN SHUGHNAN

The Shughnan district of Badakhshan was connected to standard EWS in 2018 by AKAH office. As mentioned before, the Shughnan district of Badakhshan province is a mountainous area; thus, most of its population are vulnerable from the climate-induced natural disasters.

As mentioned in chapter one, an EWS is composed of four key elements. For the CBEWS installed in Shughnan district, the key elements are described as below:

4.2.1. RISK KNOWLEDGE

Data from Shughnan province has been collecting by AKAH since 2007. Based on the historical data and long discussions and interviews with local people, the risk mapping process was done. After reviewing the historical data and having close coordination with the local people, a team of AKAH experts was deployed to the area for a transaction walk exercise to identify the vulnerability and risk exposure of the communities scientifically. Based on the findings of this team, a risk and vulnerability profile of the community is prepared by national and international experts, which is called Village Disaster Management Plan (VDMP). This VDMP, provides comprehensive socio-economic and demographic data for each village, including elements at risk and safe haven in case of a natural disaster. In each VDMP, the area is classified in three colours (red, yellow and green) each of these colours highlights the vulnerability of the area from various natural disasters, particularly the avalanche and flood.

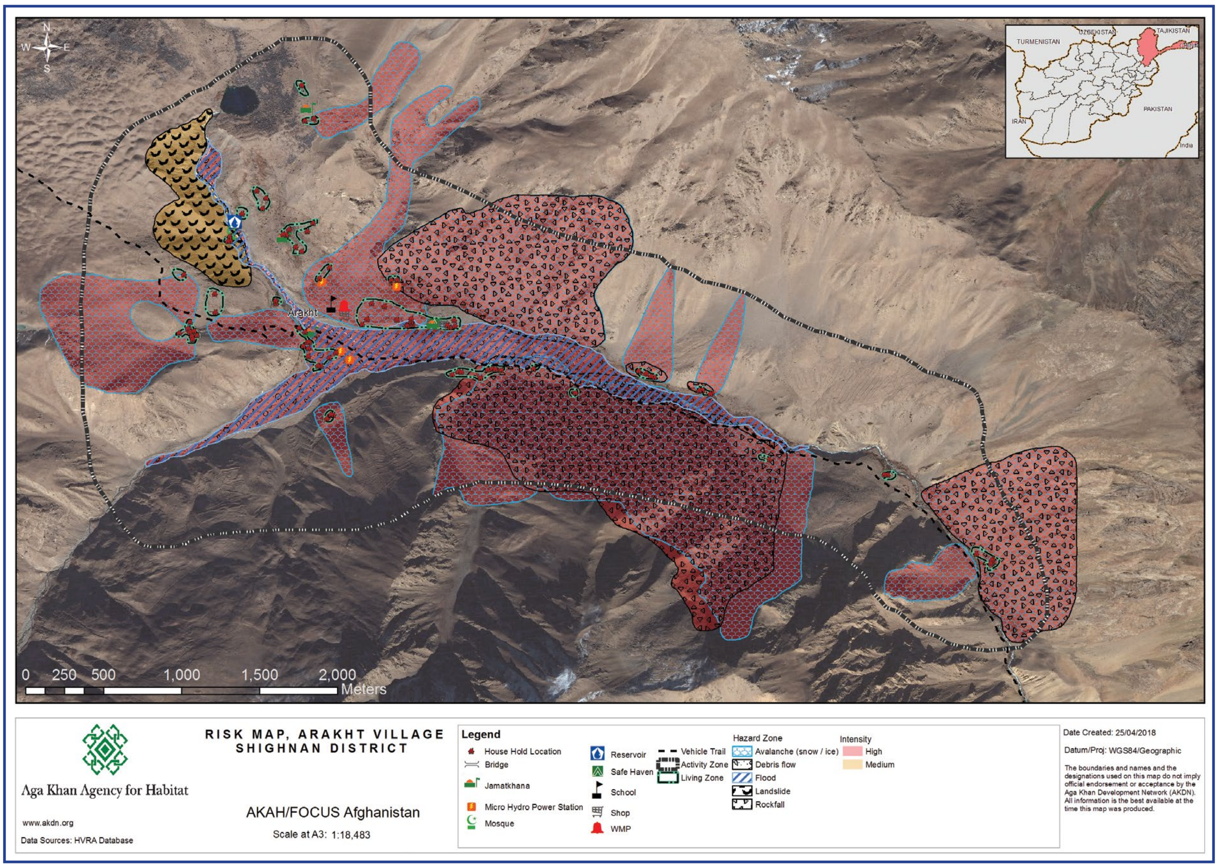

Figure 26: An Example of Risk Map of a Village of Shughnan.[73]

[73]. (AKAH, 2020)

After preparing the VDMP, a village seminar is organised in which all residents of the community participate. During that seminar, a Community Emergency Response Team (CERT) is established, which is composed of ordinary 25 people, including male and female who are trained and equipped with basic equipment for emergency response. Besides the equipment, this team is trained on first aid response, search and rescue.

AKAH has established another team in Shughnan district called, Search and Rescue Team (SART). This team is responsible for raising the awareness of the residents and train the CERT teams.

4.2.2. MONITORING AND WARNING SERVICES

Once the VDMP is developed and the vulnerable areas are identified, the feasibility studies were done to establish the EWS. As a finding of the feasibility study, two areas of Shughnan district Arakht and Werezn were selected for the installation of the WMPs. Arakht is the upper stream area of the Shughnan district and the Werezn in the lower stream area.

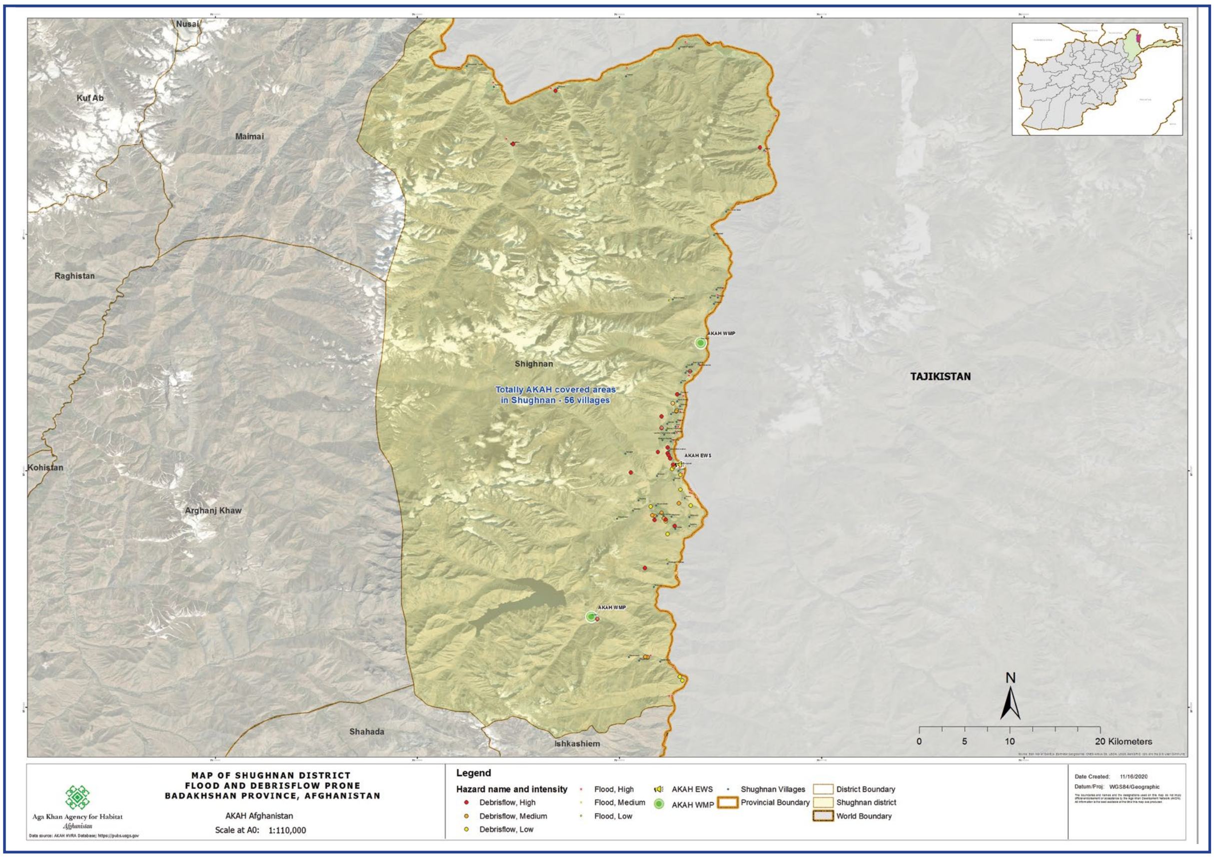

Figure 27: Map of Shughnan District District Area Covered by AKAH for FEWS.[74]

74. (AKAH, 2020)

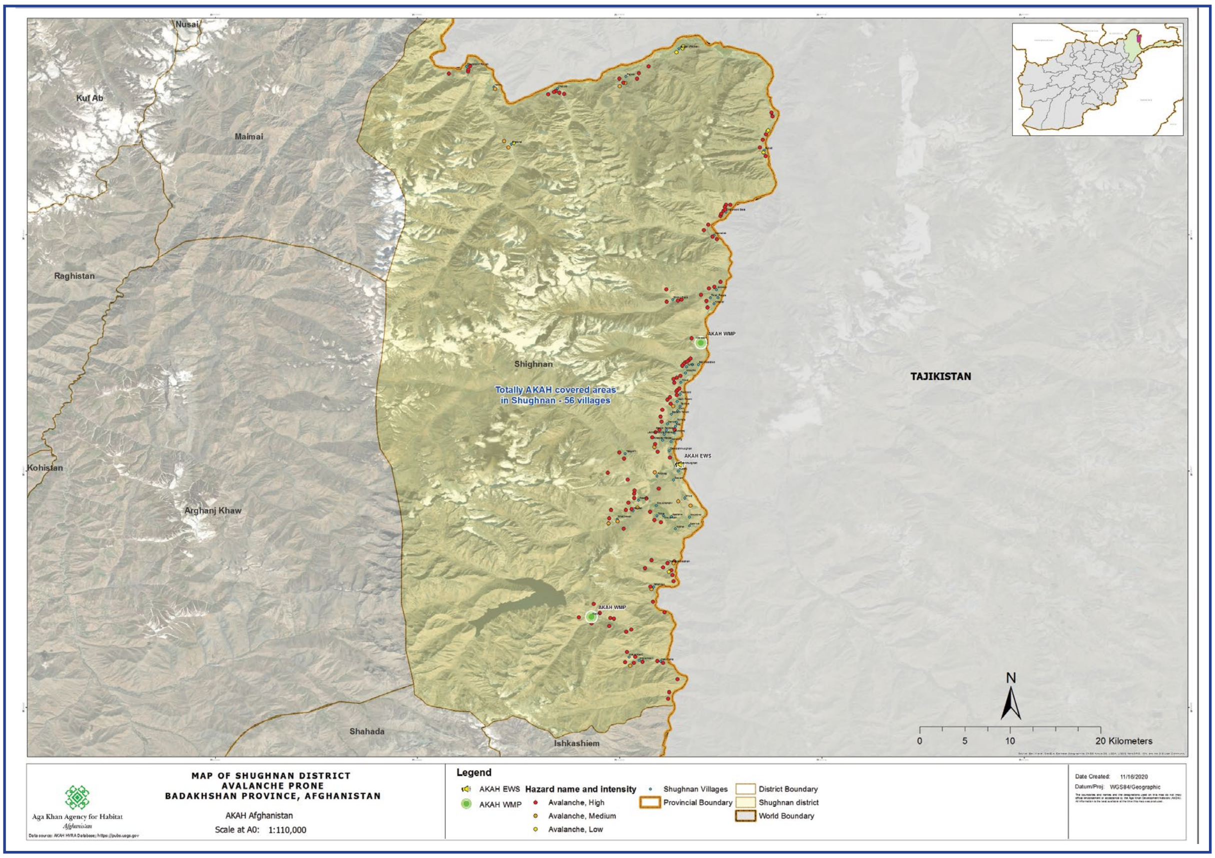

Figure 28: Map of Shughnan District Avalanche-Prone Area and the locations of AKAH WMPs.[75]

WMPs provide update data of some of the key meteorological parameters on a daily basis, such as:

- 24-hour rainfall amount,
- 24-hour snowfall amount,
- total snow depth on the ground,
- wind speed,
- wind direction,
- Daily maximum/minimum temperature,

The data of the parameters mentioned above are compiled from the WMPs by the local volunteers and is communicated via phone to the AKAH HQ in Kabul. In the field, there are five people responsible for the observation of the WMPs. These people received training on data collection and the use of the equipment installed in each WMPs. In addition to that, the care-takers (WMPs Observers) are equipped with some PPEs and technical tools.

[75]. (AKAH, 2020)

Figure 29: Werezn Area WMP ©Monib Noori@UNEP

Once the data is received in HQ, it is entered into the system and the cloud-connected server. After entering the data into the system, a group of national and international consultants review the data and compare it with other international sources for the weather forecast. This team of expert decides on the warning threshold.

If by any mean the HQ could not issue alerts, the local observers are trained, and the guidance is available for them to issue alerts. For the avalanche threshold for example, if the snow is more than 30cm in 6 hours and it is expected to snow more than 5cm/hour for the next hours, the temperature rises to plus zero, or there is wind forecasted, they issue warnings about a potential avalanche.

4.2.3. COMMUNICATION AND DISSEMINATION

Once the team at AKAH HQ decides about the threshold of the warnings, they communicate it with the head of communities and different teams that are established in the field in case they are needed to take action.

The communication is primarily via mobile phones, which is not always the best choice for a remote area such as Shughnan district. In Shughnan district, the courage area by mobile phones is minimal, and different people use different mobile networks, including the Tajik networks.

As backup means for communication, especially for emergencies, the AKAH uses other communication means such as Radio, Thuraya, Codan, VCN, etc. A list of the communication networks for EWS in Shughnan district is provided in table 5 below:

Table 5: Emergency Communication Network for EWS in Shughnan District[76]

#	Village	Communication Network
1	Andeez	Roshan, MTN, MegaFon, Tcell
2	Astana-Meyanshar	VCN
3	Bawar-Rejistek	Roshan, MTN, MegaFon, Tcell
4	Dehmurghan	Roshan, MTN, MegaFon, Tcell
5	Dehshar	Roshan, MTN, MegaFon, Tcell
6	Gharjween-Newad	VCN
7	Khawar-Redaj	Roshan, MTN, MegaFon, Tcell
8	Lochid-Parveez-Bezokh	Roshan, MTN, MegaFon, Tcell
9	Meyanshar	VCN
10	Nimda	Roshan, MTN, MegaFon, Tcell
11	Pastive	Roshan, MTN, Tcell, VCN (2G/3G)
12	Sarchashma	Roshan, MTN, Tcell, (2G/3G)
13	Sawan	Roshan, MTN, Tcell, (2G/3G)
14	Sebdeej	Roshan, MTN, Tcell, (2G/3G)
15	Senorg	Roshan, MTN, Tcell, (2G/3G)
16	Shive	Roshan, MTN, Tcell, (2G/3G)
17	Vonshar-Tirew	VCN
18	Werizn	MegaFon,Tcell Roshan, MTN, Afghantelecom, /(2G)
19	Yarkh	MegaFon, Tcell
20	Yazgam	VCN
21	Chasnood payan	MegaFon, Tcell
22	Darmarakht	Megafon
23	Arakht	VCN
24	Shoran	MegaFon,Tcell
25	Sheduge	MegaFon, Tcell
26	Sheduge Dara	VCN
27	Chasnood bala, Newadek	MegaFon, Tcell
28	Robat	MegaFon, Tcell
29	Pojwar	MegaFon, Tcell
30	Chaweed	MegaFon, Tcell, Salam
31	Shaikha (Khezri Roshan)	VCN

4.2.4. RESPONSE CAPABILITY

To effectively respond to the warnings, peoples› clarity of the messages is key. In addition to that, practical exercises of the evacuation drills and other precautionary measures are essential. This will help the local residents understand their vulnerabilities and how to react to specific warnings.

In this regard, for Shughnan district, AKAH has established various groups for an emergency response to warnings such as:

76. (AKAH, 2020)

- **Community Emergency Response Team (CERT)**

The teams were trained for two days on how to coordinate and implement the evacuation plans based on a disaster scenario, how to organise rescue process like caring casualties, finding victims, how to apply first aid for the injured person and how to search for trapped victims. There were many practical sessions during the training to enable the members to learn the techniques and apply it if any emergency is taking place in the territory. The teams are equipped with basic first aid and search and rescue tools and personal protection equipment (PPE) to respond to any incident. Each of the CERT teams is equipped with the following equipment:

Table 6: CERT toolkit for avalanche and flood preparedness and avalanche safety equipment[77]

Number	Item	Description
1	Shovel	A -14gauge iron sheet with wooden handle
2	Crowbars	Five feet long and Wt. 8kg
3	Axe	2.5 kg with wooden handle
4	Stretcher	Folding made of tarpaulin
5	Hummer	12 pound with wooden handle
6	Saw	Medium size
7	First aid box	
8	Picks	Super China, 2.3 kg with wooden handle
9	Telephone	Megaphone with battery
10	Flashlights	Medium size with wider beam and batteries
11	Waistcoat	
12	Rope	1 meter long
13	Bag	
14	Compass	With protective cap KD 351
15	Avalanche pole	For search and rescue works
16	Avalanche shovel	For search and rescue works
17	Whistle with lanyard	
18	Backpack	Waterproof -30litre volume
19	Stationary	Notebook, pens and pencils
20	Protective Goggles	Protective glasses to be used by the search and rescue team
21	Light Waist	With reflecting stripes
22	Headlight	LED with rechargeable batteries

Evacuation centres are in place. Some people do not accept the warnings, but they are evacuated by the heads of the CDCs and the CERT teams.

- **Avalanche Preparedness Team (AVPT)**

In each community, ten community members who already have the memberships of the CERTs are selected as members of the AVPT. This team receives a one-day training which aims to build the capacity of the AVPT members on how to plan for evacuation before, during and after the incident.

The teams are equipped with basic avalanche tools to help them understand the avalanche level and the possibility of avalanche occurrences.

77. (AKAH, 2020)

- **School Emergency Response Team (SERT)**

SERT team is another volunteer group in Shughnan district for emergency responses to climate-induced natural disasters at the school level. This team receives two days of training on First Aid and Search and Rescue Activities. The SERTs are also equipped with basic first aid and search and rescue tools as well as PPEs. To date (November 2020), 120 people were trained as members of the SERTs, out of this 56 are male, and 64 are female.

4.3. RESULTS AND IMPACTS

Since February 2017, the establishing year of EWS by AKAH in Shughnan until the 2019 winter, about 902 families were evacuated mostly due to the avalanche risks in that area. Overall, about 6,745 individuals have been safely evacuated in that period of time. Of that total, 3,277 of them were male, and 3,462 were female residents of Shughnan district.

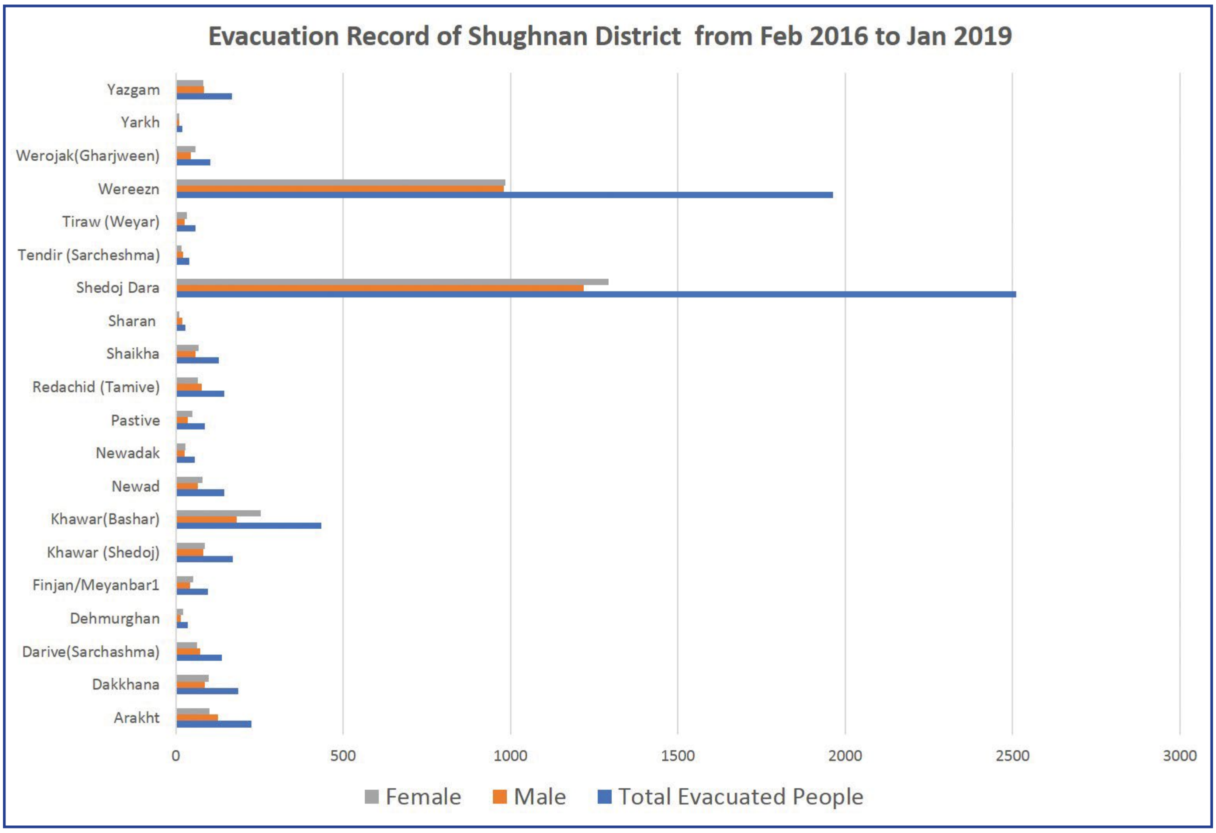

Figure 30: Shughnan District Evacuation Report Per Villages.[78]

Based on this data, Shedoj Dara and Wereezn are two of the more frequently evacuated villages of Shughnan district. The data provided in figure 30 above is only for 2017 and 2019. Since Afghanistan was facing severe drought in 2018, there is no evacuation recorded for that particular year.

[78]. (AKAH, 2020)

4.4. CHALLENGES AND LESSONS LEARNED

Figure 31: Shughnan District, ©Monib Noori@UNEP

The EWS is a unique example of its form. However, there are some challenges still existing. One of the challenges at the beginning of the establishment of the system was the lower level of the trust of people on the warnings issued. Even after gaining the trust of the residents, they did not accept the evacuation since they were not sure of the condition of the evacuation centres.

Another main challenge against this system is the limitation of the communication network. Most of the areas of the Shughnan district are partially covered by mobile networks. This fact sometimes causes challenges against the dissemination of the warnings to the public.

In addition to that, of the challenges that hinder the sustainability of this system is the lack of annual budget for the maintenance and repair of the equipment. However, to date, AKAH channelled its own scarce resources to keep the system operate well.

As described under the impacts section, this is one of the most successful examples of the CBEWS which could be replicated in other natural-disasters prone areas of the country. Although, AKAH has already extended to some other provinces such as Bamyan, Baghlan, Panjshir, and Takhar. This system is an excellent example of a people-centred EWS which is driven and led by the local people. The operation cost is much cheaper and does not require staff; the public can operate it.

ANNEX 2: PROPOSED STRUCTURE FOR EWS INSTITUTIONAL ARRANGEMENT

The figure below shows a proposed structure for EWS institutional arrangement. In this figure, AMD and NWARA monitor different hydrometeorological parameters, through their hydrometeorological monitoring stations. Using their observation data and other geospatial data, and using the global platforms to which they have access, both entities forecast floods and flash floods.

After analysing the elements which could cause a flood or flash flood, the results are shared with the Joint Warning Centre (JWC), which is comprised of the representatives from relevant entities including, ANDMA, NWARA, AMD, NSIA, and MoPW. The joint centre with its knowledge of the risk and vulnerability, analysis the forecast, and decides on warning threshold levels. The issued warning is shared to the public via mass and social media at the national level.

In case of an existing CBEWS, the warning is directly shared with the CBEWS team at the local level. ANDMA at the national level, which has a focal point in the JWC, passes the warning to its provincial office at the concerned province. It also shares the warning, with the NEWC. At the provincial level, the provincial office of ANDMA shares the warning with the local mass and social media, the PDMC, including the Provincial Governor Office, and the concerned District Governor for further dissemination to concerned people. The District Governor Office shares the received warning with the concerned CDC heads, which then share it with the people through mosques or existing CERTs. In case of existence, the District Governor Office shares the warning with the DDMC as well. Upon the forecast or issuance of warning, CBEWS also inform JWC or ask for technical support in case needed. In addition, NEWC, PDMC, CBEWS and DDMC provides support to the communities at risk in case of need. From bottom to top, each entity reports back on findings and lessons learned about the process.

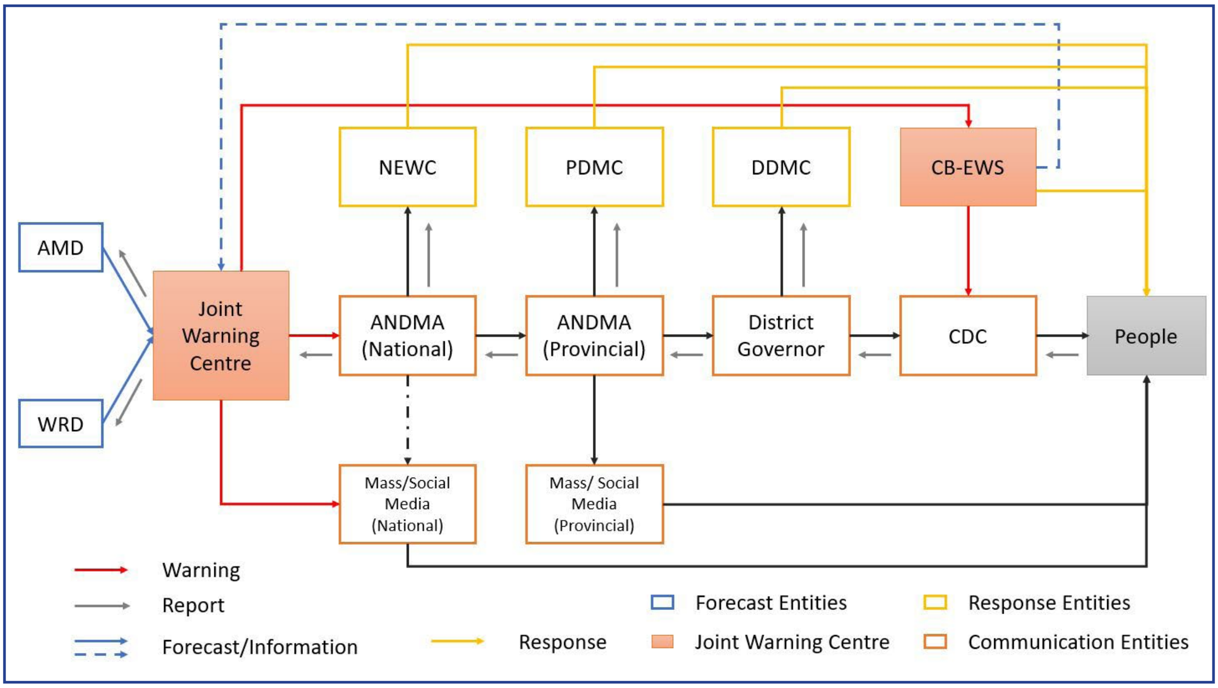

Figure 32: Proposed Institutional Arrangements for EWS in Afghanistan.

BIBLIOGRAPHY

AKAH. (2020, October 17). *A questionnaire on CBEWS in Shughnan.* (M. M. Noori, Interviewer)

AKAH. (2020, November 20). *Emergency Communication Network for EWS in Shughnan District.* Kabul, Afghanistan.

AKAH. (2020, November 20). *Map of AKAH WMPs in Shughnan District*. Agha Khan Agency for Habitat. (A. K. Habitat, Compiler) Kabul, Afghanistan.

AKAH. (2020, November 20). *Map of Shughnan District Area Covered by AKAH for FEWS*. Kabul, Afghanistan.

AKAH. (n.d.). *Arakht Village Risk Map*. Kabul, Afghanistan. Retrieved 11 20, 2020.

AKAH. (n.d.). *CERT toolkit for avalanche and flood preparedness and avalanche safety equipment.* Kabul, Afghanistan. Retrieved November 2020, 2020.

AKAH. (n.d.). *Shughnan District Evacuation Cases Record for 2017 and 2019*. Kabul, Afghanistan. Retrieved November 20, 2020.

Aljazeera. (2020, September 13). Afghanistan flooding: *Dozens dead, hundreds of homes destroyed.* Retrieved from https://www.aljazeera.com/news/2020/08/afghanistan-flooding-dozens-dead-hundreds-homes-destroyed-200826061120112.html

AMD. (2020, September 11). *Retrieved from Afghanistan Meteorological Department:* http://www.amd.gov.af/disaster-effects-in-afghanistan/

AMD. (2020, September 12). *Retrieved from Afghanistan Meteorological Department:* http://www.amd.gov.af/disaster-effects-in-afghanistan/

ANDMA. (2011). *Afghanistan Strategic National Action Plan for Disaster Risk Reduction: Towards Peace and Sustainable Development.* Kabul, Afghanistan: Afghanistan National Disaster Management Authority.

ANDMA. (2015). *ANDMA Strategy for 2015-2019.* Kabul: Afghanistan National Disaster Management Authority. Retrieved September 10, 2020, from https://www.refworld.org/cgi-bin/texis/vtx/rwmain/opendocpdf.pdf?reldoc=y&docid=5b28f2214

ANDMA. (2018). *Afghanistan Natural Disasters Risk Reduction Strategy in line with Sendai Framework*. Kabul, Afghanistan: Afghanistan National Disaster Management Authority. Retrieved from https://andma.gov.af/sites/default/files/2020-03/Persian_ASDRR.pdf

ANDMA. (2020). *Afghanistan Natural Disasters Atlas.* Kabul: Afghanistan National Disasters Management Authority.

ATRA. (2020, December 18). *Telecom Statistics.* Retrieved from Afghanistan Telecom Regulatory Authority: http://atra.gov.af/en/page/telecom-statistics-2014

Brazzola N, H. S. (2018). Five approaches to build functional early warning system. United Nations Development Programme.

CRED. (2018). *Cred Crunch 50. Natural disasters in 2017: Lower mortality, higher cost.* Retrieved from https://www.emdat.be/publications

EM-DAT. (2020, September 12). *Centre for Research and the Epidemiology of Disasters.* Retrieved from The International Disaster Database: https://www.emdat.be/database

EWC. (2006). *Developing early warning system: a checklist.* Geneva: UN Inter-Agency Secretariat of the International Strategy for Disaster Reduction. Retrieved September 2, 2020, from https://www.unisdr.org/files/608_10340.pdf

Gupte, M. (2010). *Afghanistan National Disaster Management Plan.* Kabul, Afghanistan: Afghanistan National Disaster Management Authority.

IDLG. (2020, October 12). *Badakhshan Province*. Retrieved from Independent Directorate of Local Governance: https://idlg.gov.af/badakhshan/

iMMAP. (2020, November 18). *Afghanistan Flood Risk Exposure Map.* Kabul, Afghanistan.

iMMAP. (2020, November 18). *Shughnan District Avalanche Prone Population Statistics*. Kabul, Afghanistan.

iMMAP. (2020, November 18). *Shughnan District Avalanche Risk Exposure Map.* Kabul, Afghanistan.

iMMAP. (2020, November 19). *Shughnan District Flood Prone Population Statistics.* Kabul, Afghanistan.

iMMAP. (2020, November 18). *Shughnan District Flood Risk Exposure Map.* Kabul, Afghanistan.

iMMAP. (2020). *Afghanistan Avalanche Risk Exposure Map.* Kabul, Afghanistan. Retrieved November 18, 2020.

Jack E, D. J. (2010). *Guideline on Early Warning Systems and Application of Nowcasting and Warning Operations.* Geneva: World Meteorological Organization.

NEPA. (2016). *Afghanistan: Climate Change Science Perspectives.* Kabul: Kabul: National Environmental Protection Agency & UN Environment. Retrieved September 15, 2020, from https://postconflict.unep.ch/publications/Afghanistan/UNEP_AFG_CC_Science_perspect

NEPA. (2018). *Afghanistan Second National Communication under the UNFCCC.* Kabul: National Environmental Protection Agency.

NEPA. (2019). *Biennial Update Report under the UNFCCC.* Kabul: National Environmental Protection Agency.

NEPA, U. (2016). *Climate Change in Afghanistan: What Does it Mean for Rural Livelihood and Food Security.* Kabul: United Nations Environment Programme. Retrieved September 1, 2020, from https://postconflict.unep.ch/publications/Afghanistan/Afg_CC_RuralLivelihoodsFoodSecurity_Nov2016.pdf

NSIA. (2020). *Estimated Population of Afghanistan 2020-21.* Kabul: National Statistics and Informaiton Authority. Retrieved October 15, 2020, from https://www.nsia.gov.af:8080/wp-content/uploads/2020/06/%D8%A8%D8%B1%D8%A2%D9%88%D8%B1%D8%AF-%D9%86%D9%81%D9%

NSIA. (2020). *Report of the analysis of the damages caused by the recent floods in Parwan.* Kabul: National Statistics and Information Authority. Retrieved from https://www.nsia.gov.af:8080/wp-content/uploads/2020/08/Parwan-Flooding-Report.pdf

UNEP. (2017). *Climate Change Governance.* Kabul: United Nations Environment Programme.

UNISDR. (2016). *Poverty and death: Disaster mortality 1996-2015.* United Nations International Strategy for Disaster Reduction.

USAID. (2020, September 13). *A Documentation of the Afghanistan Spacial Data Center.* Retrieved from iMMAP Afghanistan Avalanches: http://afghanistanavalanches.org

WB. (2017). *Disaster Risk Prfile of Afghanistan.* Washington: The International Bank for Reconstruction and Development. Retrieved September 12, 2020, from http://documents1.worldbank.org/curated/en/284301491559464423/pdf/114097-WP-P155025-PUBLIC-afghanist

WB. (2018). *Strengthening Hydromet and Early Warninig Services in Afghanistan: A Road Map.* Washington DC: World Bank. Retrieved September 23, 2020, from https://www.gfdrr.org/sites/default/files/publication/afghanistan-hydromet-roadmap.pdf