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Assessment on Floods of September 2024 of Nepal: People's Perception on the Issue of Rescue and Preparedness

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Abstract

The monsoon season lasts from the first week of June to the first week of October each year. In 2024, it caused disastrous floods in the final week of September, but it usually lasts until the end of September. Despite being a catchphrase, climate change affects people's lives more than most people realize. The floods have killed 250 people and destroyed several projects, including 146 bridges, 10 highways, 11 hydropower projects, 7 irrigation projects, 2605 animals, hectors of rice fields, fishponds, and more. Damages of an estimated NPR 45 billion. Eighty-five percent of respondents said that climate change is primarily to blame for landslides and floods. Rainfall fluctuated the most, by 161.6 mm. The Khumaltar in the Kathmandu Valley recorded a 158 mm variation from its maximum point in the past. In order to address and respond to the disasters that constantly occur in Nepal, the government should always be on the lookout. The local authorities must train volunteers to rescue and relocate anyone affected by the calamity. As quickly as feasible, the people's means of subsistence should be restored.

Keywords: Climate change, Damage, Floods, Perception, Preparedness

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Introduction: Nepal is comprised with high Himalaya from 8848 Meters of Sagrmatha (Mt. Everest) and the lowest part Terai plains with 60 meters in Kechana Kalan of in Jhapa district. The country occupies 147,516 sq. km of land and lies between coordinates approximately 28°N and 84°E. Nepal falls in the temperate zone north of the Tropic of Cancer (NTB, 2024)'There are eight Himalayas above the 8000 meters high including Sagarmatha, those are Kanchenjunga-8598, Lhotse (8,516 meters), Makalu) (8,463 meters), Cho oyub (8,201 Meters), Dhaulagirib (8,167 meters), Manaslu (8,163 meters), Annapurna (8,091 meters) (KC, 2018). This make the country unique in biodiversity and it makes the country vulnerable in climate change. Climate change makes the country prone to different types of disaster mainly, floods, wild fires, lightening, drought and famine, mass exodus, instinct of rare species, thief impact is ecological imbalance. "The country has heavy losses in infrastructures, agriculture damages from floods, mental health also started to come up in the surface, anxiety, distress has been increasing. The climate change has impact on, physical, economic, health and mental health to the people of Nepal'. (Rijal, 2024). 'The floods of September heavy rainfall caused by monsoon, started from 26- 29th September 2024 an it was also warned for flash floods, heavy rainfall and landslides by the Department of Hydrology and Metrology' (DHM) (Reliefweb, 2024).

Relevancy of the study: Nepal is one of the most vulnerable country disasters in the world. "The country falls in the top 20th list of the most multi-hazard prone countries in the world. The country is ranked 4th, 11th and 30th in term of climate change, earthquake and flood risk respectively. Other major disasters in Nepal are landslide, fire, drought, epidemic, storm, hailstorm, avalanches and (Glacial Lake Outburst Flood) GLOF" (Dangal, 2011). UNICEF Nepal highlighted that 'Floods, landslides, and earthquakes are among the many natural disasters that Nepal is extremely vulnerable to. In the world, it is ranked 11th for earthquake vulnerability and 16th for multi hazards' (Unicef, 2024).

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Objectives of the study: The study is to identify affected sector of the damages and perception of the people on the issue of the recent floods.

Research Method: The research is based in mixed method on the issue of floods and damages, primary data collected by the use Google form by giving 15 days' time limit, whatever response received would be analyzed by the use of SPSS and Google analysis also be used. Google form was developed in Nepali language and responses need to be translated. The outcome of the Google form is transferred to the Google sheet to analyze further.

Literature review

The precipitation in Nepal during September 26-29, 2024 was the main cause of the floods and landslides in Nepal. According to Department of Hydrology and Meteorology 'three-day precipitation from 26 September 08:45 AM to 29 September 08:45 AM' was the main cause was floods in Koshi, Mahesh, Bagmati Provinces and Eastern part of Lumbini province and Southern part of Gandaki province of Nepal' (DHM, 2024). Heavy rain caused the floods and landslides and lost life of people, property, agriculture lands. Unexpected floods caused of burst of glacier lakes of Himalayas, Nepal also vulnerable such type of floods. "The incident was later identified by the Government of Nepal as a Glacial Lake Outburst Flood (GLOF). The Thames River, swollen with mud, gravel, and boulders, destroyed 20 houses, an elementary school, and a clinic in ward 5 of Khumbu Pasang Lhamu Rural Municipality. The flood displaced 135 people, leaving the riverside settlement carpeted with debris" (Gyawali, 2024).

The Last five years floods and landslides and human casualties

Incidents	2075/76		2076/77		2077/78		2078/79		2079/80	
	Incident	Death	Incident	Death	Incident	Death	Incident	Death	Incident	Death
Floods	319	104	260	126	365	187	408	173	285	137
Land Slides	58	19	65	153	159	192	89	142	25	43

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Source: Annual Progress Report (2079/80) of Ministry of Home Affairs, Govt. of Nepal. https://www.moha.gov.np/page/annual-progress-report-2079.

The above-mentioned data indicated that every year there are floods and casualties. The incidents of floods from financial year 2075 to 2080 found 1637 and human casualties (death) 727, likewise the incidents were 396 and human casualties 549. The landslides taken life more than the floods during last five years. Landslides and heavy rain have normally found positive correlation in the case of Nepal. 'When calculated annual rainfall in mean value in between winter and summer, there is a vast variation across the country 1500 mm to 2500 mm, during summer especially in Monsoon some days 10% of the annual rainfall in one day, 50% of annual rainfall in 10 days. This type of variation of distribution of rainfall is the main cause of triggering landslides in Nepal' (DAHAL, 2011). Sometime landslides caused by earthquakes, but in the last five years there were no major earthquakes in Nepal and the landslides were occurred in monsoon seasons.

Precipitation records of Rainfall during 26-29th September 2024: During this period there were some record-breaking precipitation in different part of Nepal. The department of Hydrology and Meteorology of Government of Nepal, the record-breaking rainfall (precipitation) is tabulated as below. The record was on the day of 28th September 2024, at the 8:45 AM (DHM, 2024).

Table 1 Record breaking precipitation stations (24-hour accumulated) on 28 September, 2024 at 8:45 A.M

S,N,	Station Name	District Name	District Precipitation	Previous record (mm	Date of previous record
1	Sandhikharka	Arghakhanchi	196.6	166.0	16-Jun-2021
2	Nakheel	Bhaktapur	194.5	191.5	23-Jul-2002
3	Govindabasti	Chitwan	264.0	196.0	19-Jul-2024
4	Gajuri	Dhading	261.2	131.3	2-Jul-202
5	Chandragadi Airport	Jhapa	256.0	188.2	28-Jun-2022
6	Panipokhari	Kathmandu	206.6	198.0	14-Jun-1971
7	TIA (KTM Airport	Kathmandu	239.7	177.0	23-Jul-2002
8	Buddhanilakantha	Kathmandu	178.3	159.0	23-Jul-2002

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9	Jitpur phedhi	Kathmandu	178.3	128.2	7-Jul-2019
10	Nagarjun	Kathmandu	205.4	147.5	13-Sep-2014
11	Khopasi(Panauti)	Kavrepalanchowk	331.6	276.9	3-Sep-2015
12	Panchkhal	Kavrepalanchowk	232.5	145.0	21-Oct-1999
13	Dhulikhel	Kavrepalanchowk	224.6	220.0	23-Jul-2002
14	Godavari	Lalitpur	311.6	225.2	23-Jul-2002
15	Khumaltar	Lalitpur	294.4	136.0	10-Aug-2022
16	Tikathali	Lalitpur	264.0	207.0	23 Jul -2002
17	Khokana	Lalitpur	297.3	249.2	23-Jul-2002
18	Chapagaun	Lalitpur	323.5	200.5	23-Jul-2002
19	Daman	Makawanpur	410.0	373.2	20-Jul-1993
20	Kakani	Nuwakot	169.2	161.0	28-Jul-1972
21	Baldyanggadi	Palpa	252.0	90.4	16-Sep-2012
22	Phidim	Panchthar	172.0	148.9	20-Oct-2021
23	Baunepati	Sindhupalchok	190.6	137.5	16-Jul-1978
24	Sakhar	Tanahun	214.0	173.2	21-Jul-2020
25	Khairani **Tar**	Tanahun	252.3	241.9	17-Jul-1983

Source: (DHM, 2024)

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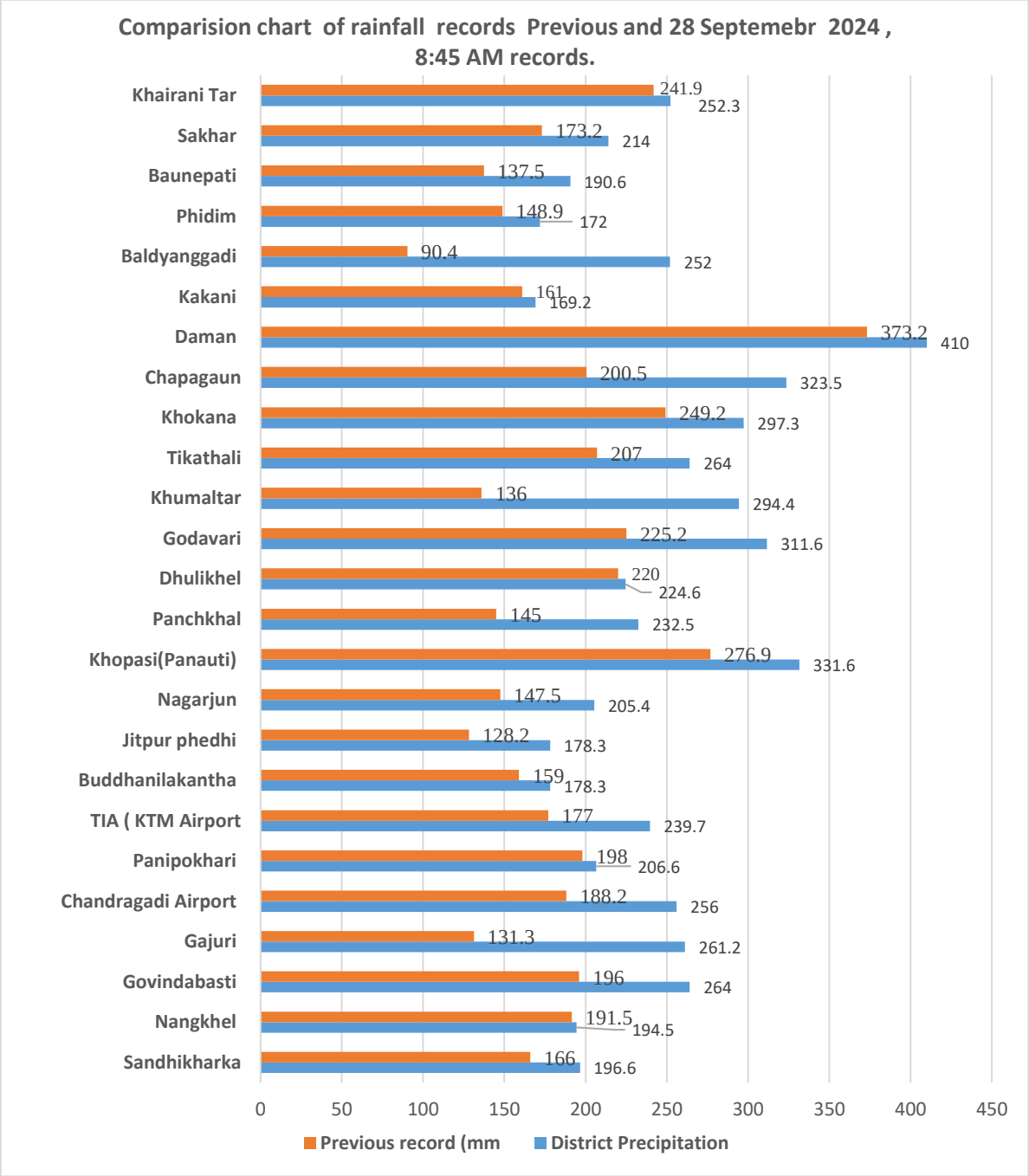

Figure 1 (DHM, 2024)

The data indicated that the rainfall broke the record of the previous record of 25 different places. Highest difference found in Balding of Palpa with 161.6 mm more than the previous one and lowest one is Arghakhanchi only difference found 3 mm. Second highest

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records in difference found in Khumaltar of 158.4 mm. If we calculate in percent of increase of rainfall of these two places found as respectively The study indicates that the higher the rainfall, the higher the floods,' there is positive correlation with the rainfall to floods' (Korbinian Breinl,David Lun & et.al., 2021).

Damage records of the floods on 27-29 September 2024

The proper assessment need to carryout and effort is ongoing to monetize the damages but NDRRM has published latest report till the date of the study is categorized as below, the situational report no3 published on October 16 highlighted as below (NDRRM, 2024).

	Category of Casualties	Death	Male	Female	Children	Missing	Injured
1	**Human**	**250**	**114**	**76**	(F.25+M35) 60	**18**	**178**
2	Residence	Fully Damaged	Partially Damaged	Displaced HH	Affected Families	Pvt. housing need	
	Total	**5916**	**12477**	**10807**	**16243**	**18403**	
3	Infra-Structure	Hydro Powers	Irrigation Projects	Highways	Affected Bridges		
	Hydro Powers	**26**	**7**	**10**	**146**		
4	**Health Sector**	**Damaged**					
	Health facilities	52					
5	**Schools**	Damaged/ Swept					
	School Facilities	**260**					
6	**Agriculture / Livelihood**	Paddy Field (Hectors)	Fish ponds (Hectors)	Fruits and vegetables (Hectors)	Sugarcane filed (Hectors)	Cardamom (Hectors)	Livestock (Nos.)
	Damaged	**58476**	**458**	**4765**	**85**	**1300**	**2605**

Source: https://bipad.gov.np/en/report. (16th October 2024)

The report indicated that 250 people lost their lives among them 32 children and 3 foreign nationals also lost their lives. The total damage and its real assessment still under calculation in terms of monitory loss. The restore livelihood, reconstruction the fully and partially damaged houses at the present cost and quality, in some cases the place need to be relocated. 'The total estimated cost of damage about NPR 46 billion' (NDRRM, 2024). In this estimation cost of schools and Health facilities are not included. The estimated cost of damage will increase. The cost of damage estimation and construction estimations

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differs, the cost of reconstruction will be better in quality and more advanced also in size and durability. Therefore, including to reconstruction of Schools and medical facilities, roads in Asian standard will cost around NPR 60 billion until the time of construction and rehabilitation.

Perception on the Issue of floods

The Google form was used to identify the perception of the people. During the given time frame of 15 days to fill the form, the response received only from 20 people. The questions were asked in Nepali language and translated in English for the purpose of analysis.

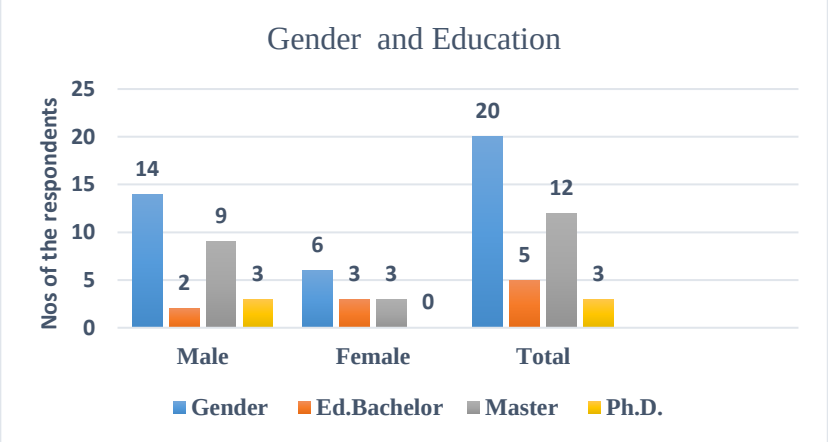
Demographic analysis: The first question was asked as please indicate your gender by ticking the given alternative. All of them responded, the participating gender found as 70 percent male and 30 percent female.

Table 2 : Demographic Analysis of the respondents (n=20)

Gender			Education			Total
	Number	Percent	Bachelor	Master	Ph.D.	
Male	14	70.0	2	9	3	14
Female	6	30.0	3	3	0	6
Total	20	100.0	5	12	3	20

Source: Primary data.

The data indicated the Bachelor level to Ph.D. level of education, 60 percent respondents were from master level of education. The education compared with the cross-tab analysis, the outcome presented in the bar chart on the right. **Male** respondents have



Ph.D. And female did not respond, who were holding Ph.D. and the Google form

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was circulated widely even in the face book of the author. Within 15 days only 20 respondents responded.

Statistics of the respondents: In the statistical analysis mean, median, standard deviation and variance view, are looked into. Mean indicated the average respondents responses, median found out the midpoint value of the respondents, 'standard deviation looks at how far individual points in a dataset are dispersed from the mean of the set and variance is also depending the calculation of **σ** St. Deviation, larger the St. Deviation more variance in the data set' (Hargrave, 2024)

	Is the effect of climate change to recent flood of Nepal?	Nepal is vulnerable to floods, during the time of writing these questions, already 224 people are dead due to floods and landslides. Why has it been happened this time?	In the capital Kathmandu, people waiting to rescue, swept away by the flood, why it happened?	In Nepal, floods, landslide, fire break out are the frequently occurring disaster events, how to protect / solve the above-mentioned disasters?
Mean	1.30	5.65	4.00	5.10
Median	1.00	6.00	5.00	4.00
Std. Deviation	0.801	0.813	1.170	2.864
Variance	0.642	0.661	1.368	8.200

Source: primary data.

If we look at the data question 3 mean value has 1.30, and median 1.0, σ .801 and variance .642, it indicated that the variance in the response not higher, less than 1 and when you look at the Q6, the σ 8.200, here the respondents have responded differently than one another, there are different responses to the questions. In this question the mean value also found higher.

Effect of climate change to recent floods of Nepal

Effect of climate change (n=20)	Frequency	Percent
Yes, it is the effect of the climate change	17	85.0
Is not the cause of climate change	1	5.0
In Nepal, Himalaya is melting and turning in black stones, Fresh water source of drying up	1	5.0
I cannot say	1	5.0

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Source: primary data

Eighty-five (85 %) percent people have a perception on record breaking floods occurred due to the effect of climate change, if we add response on Himalayas are melting responded by 5 percent of the people. The sample of Google analysis is given in the figure 2 above.

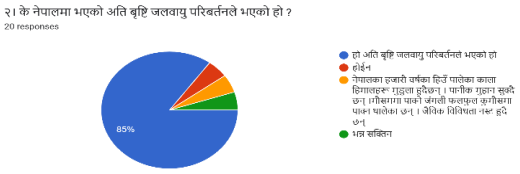

Figure 2 : Sample of Google Analysis in Nepali Language.

Q4. Nepal is vulnerable to floods, during the time of writing these questions, 224 people were dead due to floods and landslides. Why has it been happened this time?

Variables (n=20)	Frequency	Percent
Negligence of the Government	1	5.0
Not taking care of rescue Operation	1	5.0
Remoteness (Geographical remoteness)	2	10.0
All of the above	16	80.0

Source: Primary data

In the variable all of the above included negligence of the government, not taking care of in rescue operation, remoteness) responded by 80 percent of respondents and 10 percent people responded citing the problem of remoteness.

Flood Rescue Efforts in Kathmandu: Causes and Impact

Flood Rescue Efforts in Kathmandu: Causes and Impact (n=20)	Frequency	Percent
Lack of rescue equipment's/ materials	2	10.0
Not felt urgency in rescue operation	7	35.0
All of the Above	11	55.0
Total	20	100.0

Source: Primary data

Fifty-five (55%) percent of the people indicated all of the above and 35 percent of the respondents felt there was no urgency to the concerned authority to rescue the stranded people on the roof top.

Addressing Frequent Disasters in Nepal: Floods, Landslides, and Fire Outbreaks

Variables	Frequency	Percent

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Proper store house required to manage the rescue and relief materials	2	10.0
Volunteers need to prepare and trained them in the case of disasters occurred	2	10.0
The disaster relief and rescue related materials/ subject should be taught in the school	4	20.0
Settlement should be avoided (removed) which are in the risky zone	3	15.0
Regularly, the rivers should be cleaned where clogged need to remove	1	5.0
Settlement should be kept safe and constructed in safe places	6	30.0
All rescue and relief teams should be alert all the time.	2	10.0

Source: Primary data

The respondents have provided interesting solution such as 30 percent responded to keep the settlement safe and need to construct in safe places, like wise 20 percent said the disaster related subject should be taught in the school system and 15 percent said settlement should be removed if they are in risky zone.

Responses from Qualitative data

To collect open end, view a question was asked as If you want anything else to say, please write.

All together there were 14 people responded, their response was categorically analyzed by dividing into three different thematic areas such as government action and its perception, Perception-2 Recommendations and Perception 3 was on general – monitoring and preparedness. In each given view on the topic found more than one in different areas. It happens since it was open ended question. The analyzed view is presented as below.

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Perception A: Government action	No	Perception- B Recommendation	No	Perception- 3: General on monitoring and preparedness	No
i. Emphasis on systematic urbanization, industrialization and city and town development**.**	1	i. Land use policy implementation	1	If the government had adequately monitored this, it would have been less victims of this extent of disaster.	1
ii. Land management and resettlement of the population in secured places.	1	ii. Create pressure to prepare environment-friendly laws and enforce the law.	1	This is the devastation caused by the lack of pre-disaster preparation	1
iii-The trend of not fulfilling the duties	2	iii. Increasing social awareness about the environmental and ecological crisis caused by it.	1	The disaster monitoring organization should either be placed under the Prime Minister or a separate ministry should be formed.	2
iv. Climate Change is a global challenge, there should be strong laws to deal with it nationally and international level.	2	iv. Settlements need to be properly resettled in safe and secured places.	1	Due to the lack of public awareness, extreme carelessness in building structures and lack of accountability at the government level, it seems that people have suffered financial losses during disasters.	1
v. Especially in the case of Kathmandu, it is a problem that appeared due to the lack of time management	1	v: Required multi facet approach in strategy: Highlighted as- Improved Infrastructures, Reforestation, Early Warning Systems, Community Awareness and Preparedness, Sustainable Land Use Planning, Integrated Water Resource Management, International Cooperation and Required strong government commitment and community participation.	2		
Total	7		6		5

Source: Primary data

Total response to the group A- response of the government found 7 which is 50 percent of the responses received from the people. They have recorded four different views. To the group B on recommendations six response found with different view to recommend, which is 42.85 percent of the respondents and the group C is different views on general and monitoring, in this group five views recorded, which is 35.7 percent of the respondents.

Discussion: Rainfalls during rainy season regarded normal, the excessive rainfall occurred during this period the maximum difference above 100 mm found in four places, the differences recorded higher to lower respectively as Balyang Gadi of Palpa

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161.6 mm, Khumaltar of Lalitpur 158.4 mm, Gajuri of Dhading 129.9 mm, Chapa Gaon of Lalitpur 123 mm. 'The study identified the flooding is corelate with the rainfall.' (Korbinian Breinl,David Lun & et.al., 2021).

In earlier period, the hilly regions were not shaken by earthmovers. Now a days, the earth movers have been using to construct the roads in hilly and mountainous region, 'around 6,600, rural roads were constructed in Nepal since past 3 decades (1990-2020), the accumulated length of the constructed is about 60 thousand KM but most of these are not properly constructed. In 2017, there were 12, 712 excavators imported in Nepal, most of these are found JCB' (Bhusal, 2020).

There is a strong voice of the people by putting their feeling as 'land use policy should be implemented and environmental friendly law need to be formulated'(QA-group B). The conc concerns of the people need to be addressed.

Findings of the study

Unusual rainfall occurred, it was as flashfloods, it has cost 236 people's lives and estimated worth of damage NPR 25 billion, it needs to be properly surveyed.

Government is not proactive in rescue operation and alerting the people in time and found not prepared to tackle the disaster even though it was not the first time to face such disaster, local government were also not ready or prepare the stand by team to rescue and rehabilitation. People were asking help to rescue, at last they lost their lost in the flood; it happened right in the 10 to 15 minutes of proximity of the Ministry of Home Affairs government of Nepal.

Climate change is the main issue of rainfall related disaster of Nepal. Among the respondent's 90 percent of them said, yes, the torrential rain, floods and land slides related disaster at this time is the cause of climate change. 5 percent remained neutral rest 5 percent found , against the statement. Therefore, the main cause of the floods and landslides of Nepal is the climate change.

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Recommendations

- Three tires of the government should be ready through out to tackle the disasters and the people should be aware of the disasters such as floods, landslides, earthquake, fire and lightening as well.
- Land use policy should be used strictly, the settlements should be in safe places, the haphazard settlement should be resettled with proper study on livelihood and other facilities.
- Volunteers need to be trained and proper disaster related safe community centers should be made, as the country recorded as one of the disaster vulnerable country.
- People should be trained on the issue of disaster and being safe and the government should be warning the situation and the people should follow the information strictly.
- A National Disaster Authority is required under PM , it should function independently in case of rescue and relief operation, it should be capacitated to run rescue and relief operations.

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