Original Research Article

Basic Concepts of Disaster Management and Hazard Risk Vulnerability Profile of Gurugram based on DDMP 2020

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Abstract

To understand the process of disaster risk reduction and disaster management it is very important to know the usage meaning and difference between the basic concepts of disaster management. While hazard refers to probable event that can occur, disaster is actual occurrence of the event. Any event becomes a disaster after occurrence when it has very wide impact in terms of loss of life, injury to people, damage an d destruction of physical structures and environment. If an event occurs but it does not have any impact maybe because of its location of occurrence like deep inside the oceans or in remote areas where here is no habitation, then, even after occurrence it remains a hazard. Similarly, vulnerability is situation it can be physical, social or economic but risk is calculation of probable impact of disaster. Capacity improvement can lower the vulnerability, lower the risk and lower the total impact of disaster. Capacity improvement by building strong structures and creating awareness among communities will help in building a resilient society.

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Keywords: Hazard, Vulnerability, Risk, Disaster, Capacity, Disaster Management

1 Introduction

It is very important to understand the meaning and usage of basic concepts related to disaster management. It has been noticed that these terms are used interchangeably e.g. terms like disaster and hazard, risk and vulnerability without understanding the differences in their meaning. These terms are not only used interchangeably they are also interrelated, so, before understanding what is disaster management let us first define these terms and understand their meaning.

Some of the basic concepts used in study of disaster management are:

- Hazard
- Vulnerability

- Risk
- Capacity and
- Disaster

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2 Basic Concepts of Disaster management

2.1 HAZARD

Hazard is defined as potentially damaging physical events or phenomena or human activity that may cause the loss of life or injury, damage to property, livelihood and environmental degradation. Hazards can include dormant conditions that may in future cause threat to a region [16-20].

Hazards are classified on the basis of the number of factors like magnitude/intensity (earthquake, cyclone), frequency of occurrence (annual or seasonal), speed of onset (sudden or creeping) causes of their origin (man induced or natural (endogenous or exogenous), place of origin (interior of earth or exterior of earth [12].

Table 1: Classification of Hazards

Hazard A potentially damaging physical event, phenomenon or human activity, which may cause the loss of life or injury, property damage, social and economic disruption or environment degradation.	
Natural Hazards Natural processes or phenomena occurring in the biosphere that may constitute a damaging event. Natural hazards can be classified according to their (1)hydro meteorological, (2)geological or (3)biological origins.	
Origin	**Phenomena / Examples**
(1)Hydro meteorological hazards Natural processes or phenomena of atmospheric hydrological or oceanographic nature.	□Floods, debris and mudflows □Tropical cyclones, storm surges, wind, rain and other severe storms, lighting □Drought, desertification, wild line fires, temperature extreme sand and dust storm. □Permafrost, snow avalanches.
(2) Geographical Hazard Natural earth processes or phenomena that include processes of endogenous origin or tectonic or exogenous origin such as mass movements.	□Earthquake, tsunami □Volcanic activity and emissions □ Mdandslides, rockslides, liquefactions, sub- marine slides. □Surface collapse, geographical fault activities.
(3) Biological Hazards Processes of organic organs or those conveyed by biological vectors, including exposure to pathogenic, microorganism, toxins and bioactive substances.	□Outbreaks of epidemics diseases, plant or animal contagion and extensive infestation.

Technological Hazards Danger associated with technological or industrial accidents, infrastructure failures or certain human activities which may cause the loss of life or injury, property damage, social or economic disruption or environmental degradation, sometimes referred to as anthropological hazards. Examples include industrial pollution, nuclear release and radioactivity, toxic waste, dam failure, transport industrial or technological accidents (explosions fires spills).
Environmental Degradation Processes induced by human behaviors and activities that damage the natural resources base on adversely alter nature processes or ecosystems. Potentials effects are varied and may contribute to the increase in vulnerability, frequency and the intensity of natural hazards. Examples include land degradation, deforestation, desertification, wild land fire, loss of bio- diversity, land, water and air pollution climate change, sea level rise and ozone depletion.

Source: Living with Risk Hazards - Concepts and Classifications, UNISDR 2004 [13].

Of all the classifications most widely used is based on cause of origin of disaster i.e. Natural and Human Induced.

Natural hazards: Natural hazards include anything that is caused by natural processes. It can include at a very large scale earthquake or volcanic eruption or at a smaller scale or micro level falling of loose rocks on a hilly slope. Natural hazards are further classified into

- Geological for example earthquakes, tsunami, volcanic eruptions which originate from forces working within the interior of earth
- Hydro meteorological for example cyclones, floods and droughts which originate from forces and phenomena exterior of the earth
- Biological spread of diseases like malaria, plague

Man-induced hazards originate and are initiated by human activities mostly by negligence or practices like over exploitation, wrong disposal of industrial effluents, construction practices not as per government norms, non-maintenance and failure of industrial equipment, sabotage etc. Man induced disasters are basically of three categories which includes environmental degradation and technological hazards and terrorism and strife.

High Power Committee on Disaster Management in India in 1999 identified 31 types of disasters that can occur in country [11]. In 2004 after tsunami occurred in Indian ocean it was added in the list. The list of these disasters (32) is given below

Table 2: List of disasters occurring In India

1.Water and Climate related disasters
a) Floods and drainage management
b) Cyclones
c) Tornadoes and Hurricanes
d) Hailstorms

	e) Cloud burst
	f) Heat wave and Cold wave
	g) Snow avalanches
	h) Droughts
	i) Sea erosion
	j) Thunder and lighting
	k) Tsunami
2. Geological related disasters	
	a) Landslides and mudflows
	b) Earthquakes
	c) Dam failure/Dam bursts
	d) Mine disasters
3. Chemical, industrial and nuclear related disasters	
	a) Chemical and industrial disasters
	b) Nuclear disasters
4. Accident related disasters	
	a) Forest fires
	b) Urban fires
	c) Mine flooding
	d) Oil spills
	e) Major building collapse
	f) Serial bomb blasts
	g) Festival related disasters
	h) Electrical disasters and fires
	i) Air, road and rail accidents
	j) Boat Capsizing
	k) Village fire
5. Biological related disasters	
	a) Biological disasters and epidemics
	b) Pest attacks
	c) Cattle epidemics
	d) Food poisoning

Source: NCDM, High Powered Committee Report-1999 [11]

2.2 VULNERABILITY

Vulnerability includes physical, social, economic and environmental causes and processes which increase the susceptibility of an area or community to the impact of hazard. In other words, it means extent to which a community and physical structures can be affected by the impact of hazard. For example, physical location or proximity to vulnerable areas like construction of residences and commercial establishments near flood plains which are vulnerable to floods or on steep slopes in mountains vulnerable to landslides [4]. Human vulnerability is the relative lack of capacity of a person or social group to anticipate, cope with,

resist, and recover from the impact of a hazard. Human vulnerability is inversely related to the concept of human capacity. Demographic composition of any area which include proportion of dependent population groups like children and elderly people, social structure like proportion of women in population, people with disabilities are other factors. Lack of awareness and knowledge about hazards irresponsible attitude towards understanding the risk associated with hazards that can occur in region increases vulnerabilities of communities to disaster.

Thus social, economic, political and environmental conditions all together determine the vulnerability of communities and physical structures [4].

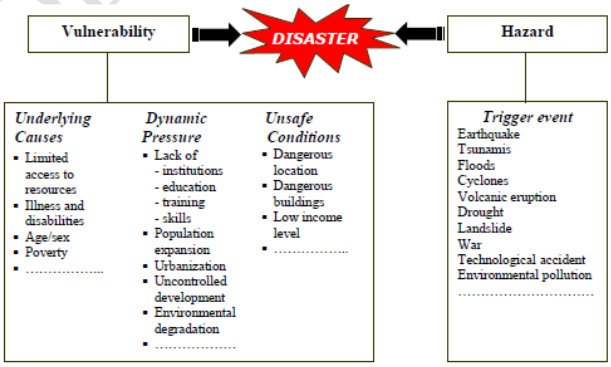
Structural or physical vulnerability is the extent to which a structure or service is likely to be damaged or disrupted by a hazard event. A building is said to be vulnerable to earthquake tremors if its construction lacks elements which would resist the effects of such tremors.

Among economic reasons poverty is most important cause of vulnerability of population. Poverty means lack of financial resources thus lack of accessibility to other resources. Poverty forces people to live in areas that have unhygienic living conditions which are unsafe and expose the communities to hazard and thus increasing their vulnerability.

Vulnerability embodies both risk and capacity of households and community to respond to shocks. It has thus two sides [15]. An external side which includes the severity and frequency of a hazard event. An internal side which refers to capacity, and resilience of the affected community. Resilience is, therefore, an integral part of the concept of vulnerability.

High vulnerability increases the degree and severity of impact of disaster. It is vulnerability and hazard together that lead to possibility of a disaster. Vulnerability is ever-changing and dynamic. With time communities can build their capacities and vulnerabilities can decline on the other hand vulnerabilities can increase with time.

Diagram1: Interrelationship between Vulnerability, hazard and Disaster

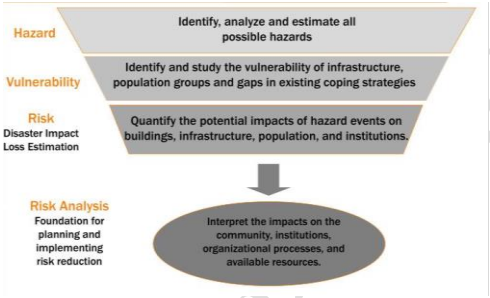


Source: GoI – UNDP, 2014 [4].

2.3 RISK

Risk refers to consequences of occurrence of disaster in an area. It is the combination of vulnerability and hazard. Risk is defined as probability or expected losses which includes deaths and injuries to population, damage and destruction to property, loss of livelihoods, shut down or disruption of economic activity and environmental damages. Risk is result of interaction between natural or human induced hazards and vulnerable conditions which trigger a disaster.

Diagram 2; Process of Risk Analysis



Source : Khazai, Bijan, 2011: Basic concepts of Risk Analysis [100]

Risk is a function of a natural hazard, in terms of severity and frequency of hazard event, and the vulnerability of an individual or group of people their physical setting, environment, and socio-economic conditions [14].

Diagram 3: Components of Risk

Source: (GoI-UNDP,2014. 4)

Risk is calculated in economic terms. For disaster planning calculation of risk and identification of high risk communities, physical installations and demarcation of regions is very important. This identification points helps in focusing of planning should be.

The relationship between hazard, risk and vulnerability is expressed as

RISK = (H X V) /C Where, H is Hazard
V is Vulnerability and
C is Capacity

Vulnerability and capacity are inversely related. High vulnerability is because of low capacity. Disaster management planning focuses on improving capacities thus reducing vulnerabilities of communities and so that impact of disaster and losses can be reduced [14].

2.4 CAPACITY

Capacity is the extent and strength of a particular community and physical structures to cope with disaster [14]. This includes capacities and resilience of both physical and human resources. Political will and leadership, management skills to implement plans and programs, improves the capacities of communities. Capacity building means efforts to improve the resilience of communities and physical structures to withstand the impact of disaster thus reducing the losses. Some of the important points related to improving the capacities of human ad physical structures are

- Develop human skills and societal infrastructure within a community to reduce the level of risk through various awareness campaigns and training programs. Creating awareness among communities through IEC. Teaching the communities to face and adapt to the risks. This will help in improving the resilience of communities.
- Developing financial, political and technological resources in the society. Mapping the available resources in the region. Taking stock of human and other resources needed in time of emergency.
- Old physical structures can be made stronger with retrofitting. And all new construction to be done following norms as advised by government.
- Economic or socially underprivileged people of society are more vulnerable to disasters because they lack resources to cope with the disasters since they often live in kuccha houses, low lying flood prone areas and don’t have access to safe shelters, lack awareness and opportunities for training etc. By relocating the poor people from risk zone, providing them low cost housing, helping them financially to build proper structures can reduce the risk. Improving the capacities of poor people by financial help, training

them and teaching them new skills to have additional source of income can also help in reducing risk.

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2.5 DISASTER

Disaster Management Act 2005 of India defines disaster as:

> "a catastrophe, mishap, calamity, or grave occurrence in any area arising from natural or man-made causes or by accident or negligence which result in substantial loss of life or human suffering or damage to and destruction of property or damage to or degradation of environment and is of such a nature or magnitude as to beyond the capacity of the community of the affected area" [7]

Any natural or man induced event remains a hazard till it occurs. It also remains an event until it has impact on people, physical structure or environment. If an event occurs in a remote area where there is no habitation, then also it remains a hazard. Hazard converts into disaster when it occurs and causes large scale damages. Some of the salient features of disaster as per definition above are that:

- It disrupts the normal functioning of society. Day to day life of people is impacted Schools are closed, industrial units get closed. People lose their jobs etc.
- It effects large area and large number of people. Any event becomes a disaster if it occurs over a large area and has impact on large population.
- It causes large scale loss of life and damage to property and environment
- It is beyond the capacity of the area/community to provide relief and recovery. Region has to depend on outside agencies for relief
- External help is required to cope with losses. To provide immediate relief and rehabilitation region has to ask for help. Sometimes international help in terms of relief and rescue and rehabilitation operations are also needed

3 DISASTER MANAGEMENT

After having defined all the basic terms and having understood their meanings and interrelationship let us now understand what is disaster management.

Disaster Management Act (2005) of India defines

"Disaster Management as a continuous and integrated process of planning, organizing, coordinating and implementing measures which are necessary for:

- Prevention of danger or threat of any disaster

- Mitigation or reduction of risk of any disaster or its severity or consequences
- Capacity building
- Preparedness to deal with any disaster
- Prompt response to any threatening disaster situation or disaster
- Assessing the severity or magnitude of effects of disaster
- Evacuation, rescue and relief, and
- Rehabilitation and reconstruction" [7]

According to above definition Disaster Management includes all processes which are part of Pre-disaster, during the disaster and post disaster phase. Disaster management is ever going and dynamic process. It changes with time and situation as vulnerabilities change with time. Disaster management and planning of any region can be effectively done through Hazard Risk Vulnerability and Capacity profile. In next section we discuss very briefly some of the important points of HRVC profile with example of Gurgaon.

4. Highlights of Hazard Risk Vulnerability and Capacity (HRVC) analysis of Gurgaon District based on District Disaster Management Plan

Assessment of disaster risk of any area can be done by Hazard Risk Vulnerability and Capacity Analysis

4. 1 HRVC Analysis

HRVC analysis comprises of following steps

- Listing of various HAZARDS to which geographical areas or communities are prone to is the first step in preparing disaster management plan of any region. Any region can be prone to one or more than one hazard. Majority of districts of India are multi-hazard prone districts. For effective and comprehensive disaster management plan of any region the first step is to identify and map all the hazards the region can face. Listing of all hazards both natural and human induced is important. For this recent occurrences of disasters for which records are available and past occurrences at least of last twenty years can be studied. This will provide all the information related to causes and impact the disaster had in the region. This will help in proper preparedness and mitigation planning for disaster management in the region. Study of onset type, probability of occurrence of hazards, time of occurrence and their frequency and magnitude all is important.

With the new technologies like remote sensing and GIS it is now easy to do the hazard mapping of the region. Hazard zonation maps of the region help in exactly identifying the region on which disaster management plans can be made.

- Listing of various RISKS associated with listed hazard of the geographical area and community. A comprehensive list of risks covering all human and physical resources which can be impacted by occurrence of disaster.
- Identify the VULNERABILITY of people, their livelihood their assets, public infrastructure. Detailed survey of all the inhabitants. Age and sex wise composition, number of disabled people. Physical and locational vulnerability of region is also important
- Map the CAPACITIES of people in terms of their coping mechanism, status of preparedness, risk management tools adopted by them. Institutional mechanism, preparedness of institutions like hospitals, fire stations, warning systems, temporary relief and rehabilitation arrangements.

In the following section we have very briefly discussed and highlighted the HRVC profile of Gurgaon based on DDMP 2020 [8]. We have tried to explain the meaning and how the basic terms which have been identified in earlier section are being used for preparing a comprehensive disaster plan.

4.2 Identification of probable disasters

Gurgaon is one of the **Multi Hazard Prone Districts** of Haryana. It is prone to a number of hazards like earthquake, hailstorm, flood, residential, industrial and commercial fires and accidents, road accidents, terrorism and epidemics.

Gurgaon Disaster Management Authority has identified probable disasters both natural and human induced which can occur. Gurgaon is one of the Multi Hazard Prone Districts of Haryana. Fourteen hazards have been identified out which five are natural and six human induced [8].

Table 3: List of probable disasters

List of Probable Disasters	
Natural	**Man Made**
Earthquakes	Fire
Flood	Industrial hazard
Drought	Bomb blast
Hail storm	Terrorism
Environmental	Epidemics

degradation	
	Road accidents
	Rail accidents
	Air accidents
	CBRN

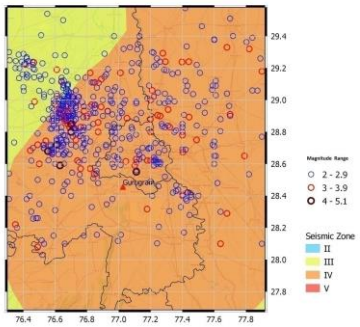
Source: GoH 2022, DDMP 2020, Gurgaon [8].

4. 2.1 Earthquake

NCR including Gurgaon falls in seismic zone IV the second highest seismically active zone of India as per seismic zone map of Indian Standard IS 1893. This makes the area liable to Modified Mercalli Intensity(MMI) of "VIII" and is considered as High Risk Zone. Such intensity may cause severe damages. The occurrence of earthquakes in Gurgaon and NCR is attributed to the existence of faults nearby. [1].

The Delhi-Gurgaon region is surrounding with various major active faults namely Delhi-Hardwar Ridge, Mahendragarh-Dehradun Fault (MDF), Delhi Sargodha Ridge (DSR), Mathura Fault (MF) and Great Boundary Fault (GBF). The Sohna Fault (SF) passes very close to Gurugram. In addition, the Himalayan active belt - Main Boundary Fault and Main Central Thrust to the north of Gurugram; and Hindukush region in Afghanistan are also the sources of strong earthquakes,

Diagram 4: Epicenters of earthquakes in NCR (M:2.0 and above)



Source: Source: GoH 2022, DDMP 2020, Gurgaon [8]

4. 2.2 Floods

There are no perennial rivers flowing in Gurgaon the main cause of floods is barsati nallahas and drains which overflow during monsoons. Rapid urbanization in Gurgaon city has also lead to heavy pressure of infrastructural development over the natural drainage system, leading to urban flooding. Lack of proper sewage, lack of rain water drainage lines clogging of drains, no

cleaning during rainfall season. There are 112 spots identified where rainwater stagnates and results in urban flooding every year [9].

4. 2.3 Drought

High demand of ground water because of rapid industrialization and urbanization are leading factors for the occurrence of drought in Gurugram district. Agriculture activities are also affected due variability in rainfall, delay in the onset of monsoon and low rainfall in catchment leads to, less water in canals and tanks, insufficient groundwater recharge thus leading meteorological, hydrological and agriculture drought. This results in situation of lack or shortage of feed and fodder, drinking water, etc. [9].

4.2.4 Epidemic

There have been reported incidence of various epidemics in Gurgaon. Some of them are seasonal occurrence like malaria, dengue chikungunya, cholera, diarrhea. The outbreaks of COVID-19, affected both rural and urban areas of the district [8].

4.2.5 Fire

Gurgaon urban agglomeration is characterized with multi-faceted activities and a large number of multi-storied buildings, increased population density and mixed occupancy, is most vulnerable to fire hazard. With increased industrialization and development of multi-storied buildings the residential density has increased Encroachment, overcrowded and haphazard growth specially in the old Gurgaon town and industrial region that is Udyog Vihar increases the vulnerability of city in case of fire after the earthquake. It also affects the movement and timely approachability of fire tenders in emergency.

JJ clusters and slum houses constructed with highly flammable material and some constructed with very toxic materials like plastics, polyethylene sheets, bamboo, soft wood etc. are also vulnerable to fire Illegal storages of combustible material like diesel etc in residential areas for generator and hazardous commercial activities also increase the vulnerability to fire. [8].

4. 2.6 Other disasters

Gurgaon has also experienced incidents of hailstorm, heat wave, cold wave and fire (both rural and urban). Incidents of industrial and chemical accidents, road accidents have also been reported. Apart from these since Gurgaon city is a big metropolitan city and is multinational hub it is vulnerable to terrorist attacks [8].

4 .3 Hazard Seasonality Map

Hazards seasonality maps depict the season when there are most chances of occurrence of a particular disaster. These are based on historical records of previous occurrence of disaster. These seasonality calendars help in creating awareness among the population and also help in preparedness for forthcoming disaster. These maps are prepared with help of communities and are depicted at prominent places in the villages and cities.

Diagram 5: Seasonality Calendar-Gurgaon

Hazards	Probable Months of Occurrence											
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Earthquake												
Flood												
Drought												
Epidemics												
Food Poisoning												
Heat Wave												
Cold Wave												
Hailstorm												
Fire												
Industrial												
Radiations												
Accidents												
Terrorist Attack												
	High Probability				Moderate				Low/ Negligible			

Source: GoH,2022: District Disaster Management Plan, Gurugram 2020 [8].

4. 4 Vulnerability Mapping

Vulnerability analysis aims to identify the socio economic groups, physical elements and infrastructure and activities that are most vulnerable to disasters.

Gurgaon is a fast developing district of Haryana. It is an industrial, residential and commercial hub of Haryana. Fast and rapid population growth, widespread urbanization and industrial growth have posed stress on available resources like land, water and environment.

Gurgaon lies in high risk earthquake zone and growth of multistory, high-rise residential apartments and commercial construction has increased the vulnerability of buildings and inhabitants.

Physical vulnerability includes location and type of residential houses people are living in. It is estimated around 34% of the houses in the district are in livable and dilapidated conditions. That means they are prone to collapse and destruction due to earthquake or floods [1] [8].

Social vulnerability includes population composition like proportion of children, elderly, women, and SC and ST population. According to 2011 census children in age group of 0-6 comprise around 13 percent of population. Children in this age groups are dependent on parents for safety, food and security purpose at time of emergency. Girls in the age group need special attention. Similarly, old age people are also dependent on family members for their needs and requirements. Women being financially dependent on men are also more vulnerable. Out of a total number of 3,20,642 households in the Gurugram district, only around 25,955 are female headed households. This also highlights dependence of female on their male counterparts as the compensation and relief during emergency usually is given to the head of households [2].

Physically, visually, mentally challenged people are also more vulnerable as they are dependent on others and may face challenge at time of disasters.

Economic vulnerability. Gurgaon attracts labor from other states as it provides job opportunities to people in industrial and construction activities. According to 2001 census, around 16.64% of district population resides in slums. They are vulnerable to health and hygiene related diseases and epidemics because of unsanitary and unhygienic living conditions. [2].

Gurgaon city has some additional and unique vulnerabilities due to its fast development and millennium urban hub. The city of Gurgaon can be clearly demarcated into New Gurgaon and Old Gurgaon. New Gurgaon is the modern part of Gurgaon. It has modern facilities and a planned infrastructure. Old Gurgaon, on the other hand, is unplanned with open drains, narrow lanes bad roads and sanitary conditions and is densely populated. Due to public-private sector partnership model in real estate development Gurgaon has emerged as the corporate capital of Haryana. It has developed because of its connectivity options to the capital. The growth prospect, increasing employment opportunities and a cleaner environment has propelled the growth forwards. Gurgaon with its location on NH8 closer to international airport, offering world-class new commercial development, office destination, corporate hub, BPO companies, IT companies etc.

Gurgaon, which is fast developing as an I.T. city of north India not only houses offices of some of the big multinational companies it also has offices of almost all major information technology (IT) companies like HCL, Hughes Software, TCS, Alcatel, IBM and GE Capital. It also has many big industries like MUL, Hero Honda etc. It also has some very big and up market residential

colonies and is slowly developing some world-class infrastructure facilities like market centers, Shopping Malls, METRO and flyovers.

Gurgaon City is the hub of many commercial activities and generates highest revenue for the state therefore it is highly vulnerable. In case of any disaster state may get economically effected.

Environmental vulnerability is also very high in Gurgaon. Because of rapid urbanization and construction activity it has led to uprooting of trees. Due to dry weather conditions sand and dust pollution in the atmosphere is very high specially during winters after harvesting season in October November. In winters and dry season, it increases proportion of particulate matter in atmosphere leading to pollution and health issues specially for children and people suffering from lung diseases.

High demand of water has resulted in lowering of ground water level because of excess of withdrawal of ground water. Every summer before monsoon there is shortage of availability of water. Decline of ground water and salinity is a major problem in the district. Ground water is declining at a rate with the range of 0.77m/yr (Bilaspur) to 1.2 m/yr (Haily Mandi) [9]

4.5 Risk

Identification and calculation of risk after a disaster occurs is important for disaster management planning. Detailed survey of all elements at risk determines not only focus area for disaster planning and preparedness it also helps in relief operations.

Table 4: Levels of risk associated with Hazards in-Gurgaon

Level of Risk	Hazard	Major Elements atRisk	Vulnerable Areas
High Risk Hazards	Earthquake	Human, cattle, publicinfrastructure	The entire district falls in high risk seismic zone IV and corresponds to MSK intensity VIII.
	Chemical Accidents	Human, environment	Manesar, Badshapur, Udyog Officer, NH-8
	Fires	Human, cattle, agricultural produce,kutcha houses, property, official records	a. MAH Units: b. Jhuggies and other high density areas c. High rise buildings

	Road Accidents	Human	Major accident – prone spots: Road near Kheri Daula toll plaza and Polytechnic College in Manesar on NH-8, Narsinghpur Village,Bilaspur Chowk, Khandsa Bus Stand, Hero Honda Chowk, Parvati crossing, Naurangpur Crossing/Rampura Chowk, Binola Industrial Area, Farrukhnagar bus stand, Kaliawas Chowk, Manesar bus stand, NSG gate on NH-8, IMT Chowk, Raisena Zone turning, Shikohpur turning, Zenpact Chowk, Qutub Plaza, Gate-4, Faridabad Road and Ambedkar Chowk on Sohna Road
	Terrorist Attack	Human, infrastructure,cattle, environment	Crowded places like bus stops, malls, hospitals, places of worship, *Melas*, market places
Medium Risk Hazards	**Drought**	Crops, cattle, humanlivelihood and environment	Entire district is prone to drought situation
Low risk Hazards	**Floods**	Human, cattle, crops,livelihood, property and other public infrastructure	a. Villages ofGurugram Tehsil: b. Villages of Pataudi Tehsil:
	Epidemic	Human	Urban and Rural Gurugram,
	Extreme Temperatures	Homeless population,people living in poor housing conditions,cattle and crops	Entire district is prone to high and cold waves
	Hailstorm	Homeless population,people living in poor housing conditions,cattle and crops	Entire district
	Railway Accident	Human, cattle	Railway stations and areas/ villages along the railway track

Source: GoH,2023 District Disaster Management Plan, Gurugram 2020 [8]

4.6 Capacity

Capacity refers to the inventory of resources that are present in the district and can be used during disaster situation for various activities and services like that of search and rescue, first aid, medical response, etc. These capacities include trained human resources i.e. number of health personnel, engineers, drivers etc, or equipment like boats, ropes, ladders, excavation machines etc, critical lifesaving facilities i.e number of beds for disaster victims, trauma centers and infrastructure, etc. areas or buildings demarcated as temporary shelters availability of stock of food etc. in the district.

Thus the capacity determines the capability of the local administration to deal with any disaster or emergency situation using the locally available resources within the district. It also helps the administration to strengthen its capacity by identifying or procuring resources which are important but not available within the district. The inventory of resources will give the district administration an idea of whether the situation can be managed locally or what and how much relief is required from outside. Gurgaon has good hospitals and health centers, fire stations, public buildings. District Disaster management plan list all the inventory of resources as well as role of institutions in all the three stages of disaster planning.

Gurgaon district has well-structured institutional framework to tackle disasters in the District. It has District Disaster Management Authority to look into disaster planning and implementation The district disaster management plan very comprehensively covers all aspects of institutional framework from listing out concerned departments and their responsibilities [8].

5 Conclusion

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Understanding basic concepts of disaster management and their relationship helps in preparing disaster preparedness plan for any area. The terms used are very simple but there is difference in their meanings. Many a times we get confused as to whether to use the term disaster or hazard. Or what is difference between risk and vulnerability. We also need to understand how capacity building helps in reducing vulnerability and minimizing risk and thus minimizing the impact of disaster. Hazard, risk, vulnerability and capacity analysis of any region helped in identifying the focus areas of disaster preparedness plans of the region.

Capacity building is the key to reduce vulnerabilities. There are various methods to improve capacities of communities and improving the resilience of the physical structures. With change in approach to disaster management where there is shift from providing relief and rehabilitation after the disaster to now including disaster management into the development process the role of capacity building process has increased. Spreading awareness among communities, including communities in preparing plans for their area, training the communities to face the disaster to providing financial support all are part of building capacities of people. Enforcing building norms, building strong structures according to norms prescribed by government based on hazards of each region improves the capacities of physical structures which can withstand the impact of disasters.

In the example of HRVC analysis of Gurgaon district of Haryana broadly based on DDMP we can see it covers all aspects of a good plan. But still we find some problems related to its implementation. Every year urban flooding during monsoons is big problem that people face due to flooding of major roads including NH8, waterlogging in colonies and flooding of basements. Incidence of fire in slums as well as industries, road accidents are other recurring disasters. There is lack of awareness campaigns for people, there is need for training of communities to tackle the problems due to disasters. There is need to develop the “culture of safety” among the people.

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