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Incident of Natural Hazards in Bangladesh A Socio Economic Crisis

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Abstract: *Bangladesh is a small country but highly populated with its marginal land. Agriculture is by far the most important economic activity in the co untry. Bangladesh does not produce enough food for its large population due to many causes; natural hazards are one of them. Bangladesh is one of the most hazard prone countries in the world. Its geographic and environmental situations mean it is prone to cyclones, flash flood, tidal surges and tornado. Bangladesh is flooded almost every year. Major floods in different years in Bangladesh cause serious damage of lives, crops and infrastructure. Affected people lost their shelter and faces severe socio-economic problem. Cyclones cause heavy loss of life and destroying large areas of crops and main economic assets. Storm surges associated with tropical cyclones is one of the most serious development constraints in the coastal areas of Bangladesh. Landslide affects lives and damages properties particularly during the monsoon in the hilly area of the country. Tornado has seriously damaged the infrastructure and sometime there are no signs of standing trees. Every year millions of people in the country are affected by riverbank erosion that destroys standing crops, farmland and homestead land. Drought, salinity and water logging restricts in crop production. The relationship between the level of development of an economy and the impact of hazard is particularly complex. Hazard vulnerability and poverty are linked and mutually reinforcing. Hazards of course causes restricted of development of Bangladesh. Large number of people is directly or indirectly affected due to losses income from crops, industries, infrastructure and disruption to economic activity due to natural hazards. Natural hazards have an adverse socio-economic impact on human being. The article is able to find out the incident of natural hazards in Bangladesh and also to analyze the socio-economic crisis during or after the time of natural hazard.*

1. Introduction

Natural hazard is a geophysical, atmospheric or hydrological event that has potential for causing harm or loss. Geologic processes effect every human on the earth all of the time but is most noticeable when they cause loss of life or property. Such life and properties threatening processes are called natural hazard. There are two broad categories of hazard: hydro meteorological likes, floods, droughts, storms and geophysical like, earthquakes, volcanic eruptions, tsunamis. Disaster can be more precisely defined as an occurrence of widespread severe damage, injury, or loss of life or property with which a community cannot cope and during which

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the society undergoes severe disruption. In brief hazard is the probability of occurrence of potentially damaging phenomenon and vulnerability is the degree of losses resulting from the occurrence of the phenomenon and risk is the damage that societies regard as troublesome.

Bangladesh is generally warm and humid throughout the year. The temperature varies from one part of the country to another, though the north may be slightly cooler than the south in winter. Temperatures in Bangladesh average about 28'C in April, the hottest month in most parts of the country. January is the coldest month in Bangladesh and average temperature is 18'C. Bangladesh receives ample rain. The eastern part of the country has an average annual rainfall of about 150 centimeters (cm) and the west has an average of about 165 cm. The far northeastern region gets the most rain-as much as 635 cm a year. In most years, the rainy season in Bangladesh lasts from mid-March to the end of October. Afternoon thunderstorms occur frequently from mid-March to mid-May. The heaviest rain comes during the monsoon season, from mid-May to October. Many of the monsoon rains cause the river to overflow and flood the surrounding countryside. Cyclones often strike Bangladesh at the end of the monsoon season. These violent storms may be accompanied by huge tidal waves that rise from the Bay of Bengal and sweep across the low-laying countryside. Some of the most severe cyclones and tidal waves have destroyed towns and villages and killed thousands of people. Bangladesh faced different types of natural hazards from its beginning and its side effects inhibit our socio-economic development. This paper attempts to find out the incidents of natural hazards in Bangladesh and also to find out the socio-economic consequences of natural hazards.

2. Incident of Natural Hazards in Bangladesh

Bangladesh is located in the Southern Asia, bordering the Bay of Bengal and between Myanmar and India. The country is physically relatively compact almost 144,000 sq. km, of which the main rivers and estuaries occupy approximately 9700 sq. km (7%), land boundaries 4246 km, territorial sea 12nm, and exclusive economic zone 200 nm. Coastline of Bangladesh extends 575 km along the Bay of Bengal. Deep inlets mark the jagged coastline of the country and small islands of the offshore delta area. Bangladesh is situated between latitudes 20°34' and 26°38' north and latitudes 88°01' and 92°41' east. The country is bordered by India on the east, west and north and by the Bay of Bengal on the south. There is also a small strip of frontier with Myanmar on the southeastern edge. The land is a deltaic plain with a network of numerous rivers and canals. Bangladesh being situated in a region of the flood plains of the mighty rivers the Padma, Brahmaputra-Jamuna and the Meghna commonly known as G-B-M. The Bay of Bengal bounds the country's 750-km

coastline in the south. The funnel shaped size of the Bay of Bengal and the low elevation of the coastal region induces the cyclones hit Bangladesh with more vigor than usual. The major tarns-boundary rivers, G-B-M, drain all its water from about 88% of its catchments area lying outside the country. This along with the heavy rainfall area outside makes the country vulnerable to flash floods, high floods and at times prolonged floods. Four types of hazard have been most important since independence in 1971-floods, cyclones and associated storm surges, riverbank erosion and drought. There are also natural hazard that have more localized impacts, like tornadoes line squalls, landslides and hailstorms. It is found that large numbers of people were killed from 1904 to 2004 due to different kinds of natural hazards in Bangladesh (Table-1).

Table-1 : Natural Hazards Occurred in Bangladesh from 1904 to 2004

Types of natural hazards	No. of events	Killed	Homeless	Affected	Damage USD (000's)
Drought	05	18	-	25,002,000	-
Earthquake	06	34	15000	19,125	-
Epidemic	28	403102	-	2,757,825	-
Extreme temperature	14	1891	-	86,000	-
Famine	01	1900000	-	-	-
Flood	64	50405	6085372	372,870,71	6165100
Wave/Surge	02	03	04	07	3,008,880
Wind Strom	141	614122	9939943	63,822,431	-
Total	259	70820667	70820667	392771659	19173980

Source: EM-DAT, 2005, as referred by Sattar, 2005

2.1 Flood

Bangladesh flooding is very much part of normal cycle of seasons. About 26,000 sq. km i.e. 18% of the country is flooded almost every year. During severe floods the affected area may exceed 52,000 sq. km. which covered 36% of the country and nearly 60% of the net cultivable area of Bangladesh (Wahra et. al. 1999). Bangladesh is flooded almost every year. There are two types of floods which occur in Bangladesh: annual flood that inundate up to 20% of the land area; and low frequent floods of high magnitude that inundate more than 35% of the area. By the greatest humanitarian threat to the people of Bangladesh is the periodic flooding that engulfs much of the land (table-2). The high downstream flow of the major rivers from the catchments area during monsoon adds to the misery of the people by causing flood. At times there are heavy downpours along the hilly region and the sudden onrush of water causes flash flood. The coincidence of high downstream flow in all the three major rivers like Padma, Meghna and Jamuna along with the local rainfall causes devastating majority of floods in Bangladesh.

Table-2 : Incident of Floods and its Effects

Years	Effects of floods
Flood 1988	The flood caused over 1500 people and 350,000 livestock deaths and damage various estimated at about US$ 1200m and established urban flooding as a national issue. GDP growth was setback severely
Flood 1998	Floods covered two-third of the country and around 15 million of people were directly or indirectly affected and over a million of people out of their home. The main monsoon aman rice was severely affected and livestock deaths were 27,000. Damaged 16,000 km roads and 4500 km embankment and destroyed crops on over 500000 ha of land. Many house holds defaulted on their loans, suffered from lack of employment and loss of purchasing power over a long period
Flood 2002	Six million people displaced and killed at least 157. Torrential rains caused flash flooding, which resulted 80,000 acres of land together with human habitation and 80% standing crop submerged under 6-7 feet in the southeastern coastal areas. In the southwestern coastal areas, more than 5000 ketch houses were completely damaged and at least 400 shrimp farms washed away; the loss has been roughly estimated at 20 million taka.
Flood 2004	About 25 % of the population across 39 districts were affected many of which were rendered homeless. Approximately 38% of the area in Bangladesh was inundated; waters began to recede in late-August, including 800,000 hectares of agricultural land. Access to potable water and sanitation facilities was diminished and caused heavy damage to major infrastructure as well as losses to the agriculture sector and small-scale enterprises including export-oriented knitwear industry.
Flood 2007	The monsoon floods showed stranded many in Bangladesh. Nearly 20 million people had been displaced. Hundreds of thousands of people in the flood-affected areas are also facing the threat of waterborne diseases due to the acute scarcity of pure drinking water.

Source: Independent, 11 July 2002 and online www. adb.org

2.1.1 Destructive Symbols of Floods in Bangladesh

Bangladesh is a country of natural hazard. Flood is the severe one among all other natural hazard. People in the country lost their shelter, homestead, crops, livestock's and earning sources almost two to three years gap due to floods. Moreover infrastructure, flood control embankment, small and cottage industry and business centre are damage and government faces shortfall of country reserve for mitigating the situation. Human settlement and agriculture have adapted to the normal flooding caused by rainfall or the overflow of riverbanks. But severe monsoon floods, like those of 1988, cause significant damage of crops, disruption to economic activity and damage to productive assets including infrastructure and non-productive assets, housing and personal effects. The 1988, 1998 and 2007 floods are in turn considered the most severe in recent experience. These floods covered around 56%, 62% and 52% areas of land respectively, implying that they were 50 and 100-year events. Floods in 1988 and 1998 caused severe damage in infrastructure

and as well as break down the earning sources of people. Garments and frozen foods industries are the prime sources of foreign exchange earning in Bangladesh. These two sectors are severely affected in the year of 2002 and 2004 due to floods. By June 20, 2007, the summer's floods had engulfed northeastern Bangladesh. Monsoon rains routinely flood the low-lying country in the summer, though some years are worse than others.

2.1.2 Recent Past Flood in Bangladesh and its Severity

In 2007 large numbers of people in Bangladesh have been suffered due to monsoon floods. More than 75 flood control embankments have been damaged, 234 upazillas and 1660 unions under 38 districts have been inundated. The floods claimed 120 lives, about six lakh houses have been partially damaged and 90,000 totally. In addition, standing crops of about six lakh acres of land have been totally damaged and a similar quantity partially affected. The government has opened 1175 flood shelter centers and is providing them with relief materials including food, safe water, clothes and cash. According to the control room, at least 1182 people are suffering from respiratory diseases, 1059 from skin diseases, 339 from eye diseases and 2831 from other diseases caused by contaminated water (WHO, 2007). Flood-hit people are suffering from acute scarcity of food and drinking water amid scarce relief activities. Most offices, schools, colleges, and markets in the flood-affected districts are inundated and remained closed due to floods. Rail and road communications including ferry service are disrupted in many parts of the country. Flood shelters are inadequate with sanitation problems and many families have taken shelter on boats, highways, embankments, and in schools and government buildings.

2.2 Cyclones

Cyclones are liable to strike coastal districts in the pre-monsoon and post-monsoon seasons, often causing heavy loss of life and destroying large areas of crops and assets. The cyclones formed in the Bay of Bengal often leave trails of devastation along the coastal region of Bangladesh. It damages the lives and properties including crops and infrastructure in the area. The cyclones generate surges up to a height of several meters which sweep through the flat coastal region killing people, animals and destroy other fauna and flora (table-3). Records of the last 200 years show that at least 70 major cyclones hit the coastal belt (BBS, 2002).

Table-3 : Major Cyclones and their Effects

Years	Speed km/hr	Tide height (ft	Effects of Cyclone
Nov 1970	224	10-15	Hit the coastal districts severely, particularly in the southwest and area of about 8100 sq. km was affected. Officially death figure was 170,000 but unofficially estimated 5, 00,000. Destroyed 4,00000 houses, 3500 schools and 20,000 fishing boats. Thousands of heads of livestock were killed and about half a million tones of food grains were lost.
Dec 1981	120	8	Around 1000 people were listed missing
May 1985	100-153	10-12	Number of death 4,624
April 1991	225	20	Number of death 1, 38,882 and ten million of people were affected. About 500000 head of cattle, goats and sheep were lost. Destroyed 1.7 million houses and 6500 schools and destroyed some of 470 km embankments. Destroyed standing crops about 278,600 acres. Damage 72,000 ha of aman rice land to salt water intrusion. Power, telephone, roads and other networks were also damaged or destroyed
Nov, 1995	210	-	Affected mainly Cox's Bazer area
May, 1997	230-275	4-5	Recorded death was 188 people & all fishermen lost at sea
Nov, 1998	90	4-6	Affected islands & chars of Khulna, Barisal amd Pautakhali districts.

Source: Alam, 2001; BBS, 2002

Majority of the storms occurs in the months of October (28%) and May (26 %). Two different types of cyclones have arisen from in the Bay of Bengal. One is the tropical cyclone, which forms during the pre-monsoon and post-monsoon seasons, which is called hurricane. The other is the monsoon depression, which develops during monsoon season, which is called storm surges. These cyclones are associated with unusually low atmospheric pressure that can produce winds of 240 km/hr, in extreme cases storm surges of 6 to 7 meter high and intense rainfalls.

2. 2.1 Hurricane

Hurricanes are a tropical cyclone. High winds and heavy rainfall characterize it. Large numbers of fisherman died every year in the sea due to the sudden attack of hurricane. Long duration hurricane hampered fish catching in the river and sea and its effects our economy

2.2.2 Storm surges

Storm surges are usually associated with the cyclone landfalls; they cause widespread damage to life and property. Storm surges hit the coast and breach embankments, putting the area in to the risk of inundation and destroying crops. Majority people of the southeast and southwest coast suffered every

year due to storm surges. Records show that world's most pronounced storm surge disasters are observed in the Bay of Bengal. The impact of cyclone of 1991 was particularly severe. A wave of up to 9-12 meters was produced and killed 200,000 people. Besides, the death toll nearly 4 million people lost their homes in addition to that 15 million people were affected both economically and psychologically. Government appealed for US$ 60 million to provide immediate relief aid. In 2002, low pressure in the Bay of Bangal caused storms that hit the coastal belt 2-2.8m higher surges. The coastal areas got inundated and suffered crop loss.

2.3 Landslide

Common in the hilly areas of southeastern Bangladesh, especially in Bandarban, Rangamati, Khagrachhari and Cox's Bazar. Every year in the rainy season landslides take place in both natural and man-induced slopes. The major roads are affected by landslides almost every year isolating the town and contiguous areas. Not only are roads but also a considerable number of infrastructures are damaged and valuable lives lost. Landslides due to the construction of buildings and other infrastructures have been mostly restricted to the urban and semi-urban centres of hill districts. The effects of Jhum cultivation and other forms of cultivation on steep slopes also play a significant role in the occurrence of landslide. Hill cutting and eradication of plant on hill cause landslide during the monsoon which causes death more than 2000 people, injured lives, damaged shelter and properties near the hill of Chittagong town in 2007.

2.4 Tornado

Tornado is special types of storm and often associated with heavy rain, hailstorm and severe straight-line wind forces. Tornado seems to be evenly distributed over the country. Tornadoes often formed at different placed, however are difficult to be located ahead of occurrence because of their small size and short duration. Tornado is common in the central part of the country and 76% of them occur during monsoon period. It has seriously damaged the infrastructure and sometime there are no signs of standing trees. In 1989 a major tornado affected 6 upazila of Manikgonj, Dhaka, Tangail districts and left over 100,000 people homeless, more than 10,000 people injured and 800 dead in a couple of minutes(Table-4).

Table-4 : Tornado Incidence and Causalities

Date	Area	Death	Injured
April 26,1964	Narail, Magura	500	-
April, 1989	Saturia, Manikgong	800	1250
May, 1993	Southern Bangladesh	50	4,000
May, 1996	Tangail and Jamalpur	500	700

Source: Tornado Project, 2004

2.5 River Bank Erosion

Every year millions of people of the country are affected by riverbank erosion that destroys standing crops, farmland and homestead land. It is estimated that about 5% of the total floodplain of Bangladesh is directly affected by riverbank erosion (Banglapedia, on-line). About 75 rivers are continuously eroding banks and depositing silt and sand along their courses. The river erosion plays havoc in certain areas where dwelling houses, fertile agricultural lands and infrastructure are all taken into the river. This renders the affected people to absolute destitution. These erosions occur predominantly along the major rivers and the coastal region of Bangladesh. Some of the most vulnerable communities live of near the riverbank. There is also widespread settlement and cultivation of chairs. These people are at constant risk from erosion, which occurs on the banks of all the rivers, but is most marked along the major rivers and their estuaries. According to the findings of Flood Action Plan (FAP) 16/19-charland study, it is found that averages of almost 64,000 people were displaced by bank erosion every year. Around 4, 40,000 people were displaced over the period of 1981 to 1992-93. It was estimated that 12% of the 1981 charland population were displaced over 11 years (1981-92). More than half of the people are displaced along the Jamuna (table-5). The erosion causes serious impact on displaced people. The valuable lands, house and agricultural crops are lost due to erosion.

Table-5 : Displaced of People by Riverbank Erosion from 1981-1993

Location of river bank	People displaced	Land lost by erosion
• People permanently left from Jamuna charland	197,000	• Total 10,63,000 ha of land were lost
• Departed from the Padma charland	123,000	• While only 19,300 ha were accreted over 1982-1992.
• People left from Meghna charland	120,000	• The net loss of 87,000 ha

Source: Disaster Monitoring and Management in Bangladesh

2.6 Drought

Droughts are recurrent features in Bangladesh. They affect plant growth, leading to loss of crop production, food shortages, and for many people, starvation. Droughts are particularly severe in northwest and southwest part of Bangladesh where monsoon rains occurs for about three months as compared to 5 months in the northeast. In 1975 Bangladesh had a major drought when about 47% of the area and 53% of the population were affected. Similar types of droughts were also observed in 1994. Drought was the lone environmental factor to cause severe crop damage in Bangladesh in 1994 (Ericksen et al 1993). The northwestern region

experienced one of the most severe droughts of the century, which started in October 1994 and was broken in July 1995 with the onset of monsoon rain. The continued drought in the northwestern districts led to a shortfall of rice production of 3.5 million tons (Rahman 1995). These districts are considered the granary of Bangladesh and produce surplus rice - the main staple of the country. However, by early 1995, the government food stock was the lowest level. The government imported 0.2 million tons of rice to offset the shortage in government stock and meet the country's requirement on an emergency basis (Rahman and Biswas, 1995). A significant quantity of food grain has already reached the country. There is a growing concern that drought hazards pose serious threats to food self-sufficiency and sustainable development in Bangladesh, since they bring crop yields.

2.7 Arsenic Contamination

Arsenic contaminated ground water has emerged as a catastrophic problem across much of Bangladesh. High level of Arsenic in ground water used for drinking or cooking water causes serious human health problems over time 5 to 15 years. They include skin ailments, damage to internal organs, skin and lung cancer and eventually death. The problem is acute for tube wells abstracting ground water from depths between 10 and 100-meter depth in the southeast, south-central and southwest regions. Estimated 20 million people drink water exceeding the Bangladesh standard for Arsenic

2.8 Salinity

Salinity intrusion is another hazard in Bangladesh, which hinders agricultural productions. Water and soil salinity is normal hazards in many parts of coastal area. A total of 1.65 million ha of land (70%) out of 2.34 million ha is affected by different degrees of soil salinity within Khulna and Barisal division (Rahman and Ahsan, 2001). Excess salinity affects crop production and drastically reduced the stock of fish varieties. It also effects on environment and biodiversity in the coastal region of Bangladesh.

2.9 Water Logging

Water logging problems are especially experienced in the western coastal zones i.e. Khulna and Jessore districts and also in the southeastern part of Noakhali and Lakshmipur districts. Water logging affects coastal livelihood because of crops damage, water borne diseases and other health related issues. Most commonly affected districts include Bhola, Patuakhali, Pirojpur and Barguna.

3. Future Hazardous Risk in Bangladesh

The World Bank report on "Natural disaster hotspots: A global risk analysis," express that from 1980 to 2003, the World Bank provided US$14.4 billion in emergency lending to 20 countries, including Bangladesh. With the exception of one of all 20 countries, half of their populations live in areas at a relatively high mortality risk from one or more hazards, and all the countries have at least half of their gross domestic product (GDP) generated in areas of relatively high economic risk from one or more hazards (Richard, 2007). The report also indicated that:

- Approximately 20 % of the earth's land surface is exposed to at least one of the natural hazards evaluated
- One sixty countries have more than one quarter of their population in areas of high mortality risk from one or more hazards;
- More than 90 countries have more than 10 % of their population in areas of high mortality risk from two or more hazards;
- In 35 countries, more than 1 in 20 residents lives at relatively high mortality risk from 3 or more hazards;
- More than 90 % of the populations of Bangladesh, Nepal, Dominican Republic, Burundi, Haiti, Taiwan, Malawi, El Salvador, and Honduras live in areas at high relative risk of death from two or more hazards; and
- Poorer countries in the developing world are more likely to have difficulty absorbing repeated disaster-related losses and costs associated with disaster relief, recovery, rehabilitation and reconstruction.

The above information is alarming for us. Bangladesh is always standing in vulnerable position due to different kinds of natural hazards. Our country is not capable to overcome the present natural hazards. So future disasters may be a threat for us and we should need appropriate preventive measures as early as possible.

3.1 Earthquake

People of Bangladesh are habituated to live with natural calamity, precisely flood, storm and tidal surge, but they are yet to experience the extent of devastation caused by a major earthquake. Experts have always given indication about a major earthquake, which may strike any part of the country at any time. Bangladesh is located in a tectonically active region close to the junction of the north moving Indian plate and the

Eurasian plate resulting in several seismic sources (fault zones) in and around the country. According the expert, the earthquake catalogue for this country and the surrounding area shows that 1200 earthquakes with $Ms^3$4.0 have occurred between the years of 1865 to 1999. During the last 150 years, seven major earthquakes with $M^3$7.0 have affected Bangladesh. If the intensity was close to 6 in the Richter scale, experts are sure that the impact could be disastrous and if it exceeded 6, then many establishments like the Kaptai hydraulic project could be destroyed. In recent years, earthquakes have occurred quite frequently in Bangladesh and have caused alarm especially in Chittagong, Moheshkhali and Sylhet causing structural damage and casualties. Occurrence of a minor earthquake (Magnitude about 4) on 19 December 2001 with its epicenter close to Dhaka has raised the possibility that next time a stronger local earthquake may strike Dhaka. On July 22, 1999 an intense earthquake shook the island of Moheshkhali causing damage to several houses, some building, killing 6 people and injuring several hundred people (Ansary et. al. 2000)

3.2. Global climate change and sea level rise

Bangladesh is a flat, delta land crisscrossed by 250 major river systems that drain southward from the Himalayas to the Bay of Bengal. It is also vulnerable to slight rises in the level of the bay, which may be accelerated by global warming. Bangladesh is at great risk from global climate change because of it very low elevation and exposure to various water related hazards. Global climatic change will create problem in future, especially majority of the low land near the Bay of Bengal may be inundated and change in water levels and induced water logging. It will also promote salinity in ground and surface water, erosion and accretion.

3.3. Tsunami

Tsunami is a Japanese word meaning 'harbor wave' and used as the scientific term for seismic sea wave generated by an undersea earthquake or possibly an undersea landslide or volcanic eruption. Most tsunamis originate along the Ring of Fire, a zone of volcanoes and seismic activity, 325, 00 km long that encircles the Pacific Ocean. Since 1819 about 40 tsunamis have struck the Hawaiian Islands. There happened severe Tsunami in the Southeast Asia in 26 December 2004. Many people near the coastal area lost their lives and shelters. Bangladesh has slightly affected at the time of that tsunami.

4. Conclusion

Natural hazards causes lose of life, physical damage and disruption of society and the national economy. The effects of natural hazards like floods; cyclones, drought, insects and diseases hampered crop production

that resulted reduction of Gross Domestic Product in agricultural sectors. A flood causes severe damage in infrastructure and as well as growing crops and also affects health. The people catch large quantities of fish in the coastal waters of the Bay of Bengal for their own use and for export. But every year large numbers of fishermen lost their lives in the sea due to sudden cyclone and hurricane attacks, which indirectly affect our economy. Besides, cyclones often strike Bangladesh at the end of the monsoon season. Some of the most severe cyclones and tidal waves have destroyed towns and villages and killed numbers of people and destroyed infrastructure. From an economic and development perspective, pests and diseases are also threats to agriculture and other activities based on renewable natural resources. Severe earthquakes have been rare, but are a potentially catastrophic hazard. Salinity and arsenic contamination in ground water are environmental hazards. An economic point of view, disaster is a 'shock' that results in a combination of losses in the human, social and physical capital stock. It reduces in the flow of economic activity such as income generation, investment, production, consumption and employment. Similarly, natural hazards reduce in output as losses like crops, fishes and damages infrastructure that directly or indirectly affect majority of people in our country.

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