

Environmental Disasters in History

Renu Bhargava

Indira School of Business Studies, Pune, India

Abstract

This paper deals with the definition of a methodological framework consistent with the need and scope of environmental disaster, the adoption of contemporary mitigation plans and risk management policies. The research paper also illustrates temporal and spatial distribution of past disasters, elaboration of some events and categorization of affected targets at several places. Finally the research paper establishes the facets of disasters caused by dangerous natural phenomenon and those endangered by interrelated human-nature induced factors, such as deforestation, oil spills, global climate change, desertification, droughts etc. The paper also makes an attempt to portray how 'natural' and the 'human' are inextricably bound together in hazardous situations.

Keywords: Environment, disaster, management, history

Introduction

An environmental disaster is the tragedy of a natural or human-made hazard (a hazard is a situation which poses a level of threat to life, health, property, or environment) that negatively affects society or environment. In contemporary academia, disasters are seen as the consequence of inappropriately managed risk. These risks are the product of hazards and vulnerability. Hazards that strike in areas with low vulnerability are not considered a disaster, as is the case in uninhabited regions.

A natural disaster is the effect of a natural hazard (e.g. flood, tornado, volcano eruption, earthquake, or landslide) that affects the environment, and leads to financial, environmental and/or human losses. The resulting loss depends on the capacity of the population to support or resist the disaster, and their resilience. Many natural hazards are related, e.g. earthquakes can result in tsunamis, drought can lead directly to famine and disease. The local communities at the time of disaster or before the disaster make groups for helping the people from suffering during the disaster. Some such groups that have been formed in different countries are, First Aid group, Health group, Food and Welfare group, and innumerable other voluntary or government organized associations. They all are well trained by some local community members. All the groups are sent for helping any other local community that is suffering from a disaster. They also migrate the people from the area affected from disaster to some other safe regions. They are given shelter and every possible facility by those local management communities.

Today, Governments in various countries also make effort to provide immense disaster relief. In India, in the rural areas, the community (group of families) are choosing a leader and developing their disaster management skills to protect themselves and other local communities as well.

Objective of Research

The paper submits a secondary research on historical survey of natural and anthropogenic disasters of the past. The objective is to take advantage of the antecedent experience to overcome the effects of future ecological disasters.

Impact of Environmental Disasters

For more than a century researchers have been studying disasters and for more than forty years disaster research has been institutionalized. The studies reflect a common opinion when they argue that all disasters can be seen as being human-made, their reasoning being that human actions before the strike of the hazard can prevent it developing into a disaster. All disasters are hence the result of human failure to introduce appropriate disaster management measures.

Although complex disasters, where there is no single root cause, are more common in developing countries. A specific disaster may spawn a secondary disaster that increases the impact. A classic example is an earthquake that causes a tsunami, resulting in coastal flood.

The impact that disasters have on the physical world and society are extraordinary. Our very planet was shaped by plate-shaking earthquakes, volcanic eruptions, and furious storms. Today, more than a million earthquakes occur each year! At least 1,000 of those cause property damage, and about 15,000 people perish each year. The National Geographic Society reports roughly 75 million people have died from earthquakes in recorded history. And that is not counting the hundreds of millions who have been lost in famines, plagues, floods, and other disasters. In addition, the annual cost in 1980 of property damage was approximately \$40 billion globally.

As many researchers and scientists have studied the occurrence of natural disasters and human response, they have come up with a sequence of phases, first described by J.W. Powell. They include:

1. *the warning*: when the threatening conditions are first registered
2. *the threat*: when the majority of people become aware of the coming danger
3. *the impact*: when the event hits
4. *the inventory*: when victims realize what has happened
5. *the rescue*: when immediate help of survivors is initiated
6. *the remedy*: when deliberate and formal actions are organized

7. *the recovery*: when individuals reestablish the old order or form a new, stable situation out of the disorder.

Although we are able to assess property damage and death tolls, it is impossible to place a price on the socioeconomic effects on the world as a whole. Psychological impact, cultural treasures, and human potential are things that can never be recovered.

However, through the pain and devastation, natural disasters do teach us important lessons. Scientists and engineers can study global cataclysms to learn more about our world and universe. By examining disaster sites and assessing damage, more can be done to safeguard our lives against catastrophe. Better building designs, structural materials, precautions, and warning systems can be created to save people and property. And most of all, disaster can teach each and every one of us just how precious life can be.

Importance of study of environmental disasters in current environment

Importance of the study of past disasters, often referred in research as disaster archeology, is the impact of disasters and the aftermath of resultant damage. Developing countries suffer the greatest costs when a disaster hits – more than 95 percent of all deaths caused by disasters occur in developing countries, and losses due to natural disasters are 20 times greater (as a percentage of GDP) in developing countries than in industrialized countries.

Various Forms of Resultant Impact

Destruction

Catastrophic event that causes a lot of casualties, injuries and deaths, destruction of human property, disturbs ecosystems stability. It may be of natural, environmental, human induced or technological origin.

Pollution

The presence of pollutants (substances, noise, radiation etc) in the environment in such a quantity, concentration or duration, that may cause harm on human health, on the proliferation of living organisms, and on the equilibrium of ecosystems, making the environment unfit for human use.

Contamination

Any kind of pollution that is characterized by pathogens or markers testifying their presence. Any kind of undesirable or dangerous changes in the physical, chemical or biological properties of the air, ground or water, that may threaten the survival of any form of life on earth.

Degradation

Negative impact of pollution on the equilibrium, the quality of life, the salvage of cultural heritage and the aesthetic values of human communities.

Impact of Disaster in Indian Sub-Continent

With the tropical climate and unstable landforms, coupled with high population density, poverty, illiteracy and lack of adequate infrastructure, India is one of the most vulnerable developing countries to suffer very often from various natural disasters, namely drought, flood, cyclone, earth quake, landslide, forest fire, hail storm, locust, volcanic eruption, etc., which strike causing a devastating impact on human life, economy and environment. The rapid growth of population and its increased concentration often in hazardous environment has escalated both the frequency and severity of natural disasters. With the tropical climate and unstable land forms, coupled with deforestation, unplanned growth proliferation non-engineered constructions which make the disaster-prone areas mere vulnerable, tardy communication, poor or no budgetary allocation for disaster prevention, developing countries suffer more or less chronically by natural disasters. Though it is almost impossible to fully recoup the damage caused by the disasters, it is possible to (i) minimize the potential risks by developing early warning strategies (ii) prepare and implement developmental plans to provide resilience to such disasters (iii) mobilize resources including communication and telemedicine services, and (iv) to help in rehabilitation and post-disaster reconstruction. Space technology plays a crucial role in efficient mitigation of disasters. While communication satellites help in disaster warning, relief mobilization and telemedicine support, earth observation satellites provide required database for pre-disaster preparedness program, disaster response, monitoring activities and post-disaster damage assessment, and reconstruction, and rehabilitation.

Literature Survey on Environmental Disasters

Natural Environmental Disaster

Natural environmental disasters are any natural occurrences that cause widespread distress, usually including loss of human life and notable damage to socio-ecological systems and property. They may cause large-scale damage from which recovery is either impossible or longterm. They have the power to shake the universe. Natural disasters can happen at any time or place. They can bring sorrow, but they can also teach important lessons about who we are, what is important to us, and what joys life can hold for every human being.

Natural disasters are often frightening and difficult for us to understand, because we have no control over when and where they happen. What we can control is how prepared we are as communities and governments to deal with the dangers that natural disasters bring.

The boxing-day tsunami which devastated Indonesia and the 2005 earthquake in Kashmir, Pakistan were both natural disasters whose effects were made worse by underdeveloped infrastructure and widespread poverty. Tsunamis, earthquakes, hurricanes or any other natural disaster can't be

avoided, but with good preparation and well-organized help after the fact, it is possible to survive and go back to normal life afterwards.

Natural disasters include, but are not restricted to, the following:

- Avalanche
- Drought
- Dust storm
- Earthquake
- Fire
- Flood
- Fog
- Hurricane (Cyclone, Typhoon)
- Landslide
- Meteor
- Monsoon
- Snow storm (Blizzard)
- Thunderstorm
- Tornado
- Tsunami
- Volcano
- Windstorm

It is important to know that, many times, one natural disaster triggers or is accompanied by another. For example, earthquakes and volcanoes sometimes occur together because they are both caused by geologic movements. Earthquakes can damage water pipes, causing wildfires. They will sometimes trigger tsunamis, which in turn flood the land, causing landslides. Hurricanes can cause thunderstorms and heavy rain that causes avalanches. Each tiny change within earth's atmosphere, including human activity, can affect something else in this dynamic system. Natural disasters are caused mainly by weather and geology - the turning and churning of our planet as it moves around the sun creates weather patterns, storm systems, and climate differences, while our earth shifts on plates and rivers of magma deep beneath the crust. Our world is immensely alive, everyday, under our feet. Sometimes those interactions manifest themselves as great global changes that we call natural disasters.

Descriptive Study of some common Natural Environmental Disasters and their Impact

The examples and perspective presented are a simplistic narration of common natural environmental disasters and do not represent a worldwide view of the subject.

Land movement disasters

Avalanches

An avalanche is a rapid flow of snow down a slope, from either natural triggers or human activity. Typically occurring in mountainous terrain, an avalanche can mix air and water with the descending snow. Avalanches are one of the most awesome natural disasters on earth, with the force to do massive destruction and damage. Luckily, however, these incidents are isolated to mountainous regions where heavy snow is common.

Notable avalanches include:

- The 1910 Wellington avalanche
- The 1954 Blons avalanches
- The 1970 Ancash earthquake
- The 1999 Galtür Avalanche
- The 2002 Kolka-Karmadon rock ice slide

Earthquakes

An Earthquake is a sudden shake of the Earth's crust. The vibrations may vary in magnitude. The earthquake has point of origin underground called the "focus". The point directly above the focus on the surface is called the "epicentre". Earthquakes by themselves rarely kill people or wildlife. It is usually the secondary events that they trigger, such as building collapse, fires, tsunamis (seismic sea waves) and volcanoes that are actually the human disaster.

Some of the most significant earthquakes in recent times include:

- The 2004 Indian Ocean earthquake, the second largest earthquake in recorded history, registering a moment magnitude of 9.3. The huge tsunamis triggered by this earthquake cost the lives of at least 229,000 people.
- The 7.6-7.7 2005 Kashmir earthquake, which cost 79,000 lives in Pakistan.
- The 7.7 magnitude July 2006 Java earthquake, which also triggered tsunamis.
- The 7.9 magnitude May 12, 2008 Sichuan earthquake in Sichuan Province, China. Death toll at over 61,150 as of May 27, 2008.

Lahars

A lahar is a volcanic mudflow or landslide. The 1953 Tangiwai disaster was caused by a lahar, as was the 1985 Armero tragedy in which the town of Armero was buried and an estimated 23,000 people were killed.

Landslides

A **landslide** or **landslip** is a geological phenomenon which includes a wide range of ground movement, such as rock falls, deep failure of slopes and shallow debris flows, which can occur in offshore, coastal and onshore environments. Although the action of gravity is the primary driving force for a landslide to occur, there are other contributing factors affecting the original slope stability. Typically, pre-conditional factors build up specific sub-surface conditions that make the area/slope prone to failure, whereas the actual landslide often requires a trigger before being released.

Volcanoes

A volcano is an opening, or rupture, in a planet's surface or crust, which allows hot magma, ash and gases to escape from below the surface. The word *volcano* is derived from the name of Vulcano island off Sicily which in turn, was named after Vulcan, the Roman god of fire. Types of volcanic eruptions can be Lava, Volcanic Ash or Supervolcanos.

Types of volcanic eruptions

- An **Eruption** may in itself be a disaster due to the explosion of the volcano or the fall of rock but there are several effects that may happen after an eruption that are also hazardous to human life.
- **Lava** may be produced during the eruption of a volcano a material consisting of superheated rock. There are several different forms which may be either crumbly or gluey. Leaving the volcano this destroys any buildings and plants it encounters.
- **Volcanic ash** - generally meaning the cooled ash - may form a cloud, and settle thickly in nearby locations. When mixed with water this forms a concrete like material. In sufficient quantity ash may cause roofs to collapse under its weight but even small quantities will cause ill health if inhaled. Since the ash has the consistency of ground glass it causes abrasion damage to moving parts such as engines.
- **Supervolcanos** : According to the Toba catastrophe theory 70 to 75 thousand years ago a super volcanic event at Lake Toba reduced the human population to 10,000 or even 1,000 breeding pairs creating a bottleneck in human evolution. It also killed three quarters of all plant life in the northern hemisphere. The main danger from a supervolcano is the immense cloud of ash which has a disastrous global effect on climate and temperature for many years.
- **Supervolcanos** consist of a cloud of hot volcanic ash which builds up in the air above under its own weight and streams very rapidly from the mountain burning anything in its path. It is believed that Pompeii was destroyed by a pyroclastic flow.

Water disasters

Floods

A flood is an overflow or accumulation of an expanse of water that submerges land. Flooding may result from the volume of water within a body of water, such as a river or lake, which overflows or breaks levees, with the result that some of the water escapes its normal boundaries. While the size of a lake or other body of water will vary with seasonal changes in precipitation and snow melt, it is not a significant flood unless such escapes of water endanger land areas used by man like a village, city or other inhabited area.

Some of the most notable floods include:

- The Huang He (Yellow River) in China floods particularly often. The Great Flood of 1931 caused between 800,000 and 4,000,000 deaths.
- The Great Flood of 1993 was one of the most costly floods in United States history.
- The 1998 Yangtze River Floods, also in China, left 14 million people homeless.
- The 2000 Mozambique flood covered much of the country for three weeks, resulting in thousands of deaths, and leaving the country devastated for years afterward.

Limnic Eruptions

A limnic eruption occurs when CO₂ suddenly erupts from deep lake water, posing the threat of suffocating wildlife, livestock and humans. Such an eruption may also cause tsunamis in the lake as the rising CO₂ displaces water. Scientists believe landslides, volcanic activity, or explosions can trigger such an eruption.

Till date, only two limnic eruptions have been observed and recorded

Limnic eruptions in the past:

- In 1984, in Cameroon, a limnic eruption in Lake Monoun caused the deaths of 37 nearby residents
- At nearby Lake Nyos in 1986 a much larger eruption killed between 1,700 and 1,800 people by asphyxiation.

Tsunamis

Tsunamis can be caused by undersea earthquakes as the one caused in Ao Nang, Thailand by the 2004 Indian Ocean Earthquake, or by landslides such as the one which occurred at Lituya Bay, Alaska.

Some of the notable Tsunami include

- Earthquake of 9.0 and the resulting tsunami in 2004-05 created one of the world's worst disasters. It did major damage to: Indonesia, India, Sri Lanka, Thailand, Malaysia, Myanmar, the Maldives, Somalia, Tanzania, Seychelles, Bangladesh, and Andaman. Deaths: Between 235,000 and 285,000.
- Lituya Bay, Alaska (1953). A mega-tsunami occurred here, the largest ever recorded.

Weather disasters

Blizzards

A **blizzard** is a severe storm condition characterized by low temperatures, strong winds, and heavy blowing snow. The difference between the blizzard and a snowstorm is the wind that blizzards have, by definition. Ground blizzards are a variation on the traditional blizzard, in that ground blizzards require high winds to stir up snow that has already fallen, rather than fresh snowfall. Regardless of the variety of blizzard, they can bring near-whiteout conditions, which restrict visibility to near zero. Blizzards have a negative impact on local economies, and can paralyze regions where snowfall is unusual or rare for days at a time.

Significant blizzards in the United States include:

- The Great Blizzard of 1888
- The Schoolhouse Blizzard earlier the same year
- The Armistice Day Blizzard in 1940
- The Storm of the Century in 1993

Cyclonic storms

Cyclone, tropical cyclone, hurricane, and typhoon are different names for the same phenomenon of a cyclonic storm system that forms over the oceans.

Tropical cyclones can result in extensive flooding and storm surge, as happened with:

- Bholá Cyclone, striking East Pakistan (now Bangladesh) in 1970,
- Typhoon Nina, striking China in 1975,
- Tropical Storm Allison, which struck Houston, Texas in 2001 and
- Hurricane Katrina, which left most of New Orleans under water in 2005. Much of the flooding was due to the failure of the city's levee system.

Hailstorms

Hailstorms are rain drops that have formed together into ice. A particularly damaging hailstorm hit Munich, Germany on August 31, 1986, felling thousands of trees and causing millions of dollars in insurance claims.

Heat waves

The heat wave in Victoria Australia caused the massive bushfires in 2009, Melbourne experienced 3 days in a row of temperatures exceeding 43°C.

Supercell Tornadoes

Some of the most violent tornadoes develop from supercell thunderstorms. A supercell thunderstorm is a long-lived thunderstorm possessing within its structure a continuously rotating updraft of air. These storms have the greatest tendency to produce tornadoes, some of the huge wedge shape. The supercell thunderstorm has a low-hanging, rotating layer of cloud known as a “wall cloud.” It looks somewhat like a layer of a layer cake that hangs below the broader cloud base. One side of the wall cloud is often rain-free, while the other is neighbored by dense shafts of rain. The rotating updraft of the supercell is seen on radar as a “mesocyclone.” The tornadoes that accompany supercell thunderstorms are more likely to remain in contact with the ground for long periods of time—an hour or more—than other tornadoes, and are more likely to be violent, with winds exceeding 200 mph.

Firewhirls

Sometimes the intense heat created by a major forest fire or volcanic eruption can create what is known as a firewhirl, a tornado-like rotating column of smoke and/or fire. This happens when the fire updraft concentrates some initial weak whirl or eddy in the wind. Winds associated with firewhirls have been estimated at over 100 mph. They are sometimes called fire tornadoes, fire devils, or even firenadoes.

Fire

Wildfires are an uncontrolled fire burning in wild land areas. Common causes include lightning and drought but wildfires may also be started by human negligence or arson. They can be a threat to those in rural areas and also wildlife. A notable case of wildfire was the 2009 Victorian bushfires in Australia.

Health and diseases

Epidemic

An epidemic is an outbreak of a contractible disease that spreads at a rapid rate through a human population at the same time: an epidemic outbreak of influenza, such as the A H5N1 virus, which causes Avian influenza. A pandemic is an epidemic whose spread is global. There have been many epidemics throughout history, such as Black Death. In the last hundred years, significant pandemics include:

- The 1918 Spanish flu pandemic, killing an estimated 50 million people worldwide

- The 1957-58 Asian flu pandemic, which killed an estimated 1 million people
- The 1968-69 Hong Kong flu pandemic
- The 2002-3 SARS pandemic
- The AIDS epidemic, beginning in 1959
- The H1N1 Influenza (Swine Flu) Pandemic 2009

Famine

In modern times, famine has hit Sub-Saharan Africa the hardest, although the number of victims of modern famines is much smaller than the number of people killed by the Asian famines of the 20th century.

Drought

Droughts are characterized by feeling of dryness in the throat. The land is barren and covered in thin dust. Cracks appear in the earth. This is drought, when water is so scarce that the existence of life becomes threatened.

Well-known historical droughts include:

- 1900 India killing between 250,000 and 3.25 million.
- 1921-22 Soviet Union in which over 5 million perished from starvation due to drought
- 1928-30 northwest China resulting in over 3 million deaths by famine.
- 1936 and 1941 Sichuan Province China resulting in 5 million and 2.5 million deaths respectively.
- As of 2006 Western Australia New South Wales Victoria Australia Victoria and Queensland states of Australia have been under drought conditions for five to ten years. The drought is beginning to affect urban area populations for the first time.
- In 2006 Sichuan Province China experienced its worst drought in modern times with nearly 8 million people and over 7 million cattle facing water shortages.

Literature Survey on Anthropogenic Disasters

Anthropogenic disasters are man-made disasters. These are events which, either intentionally or by accident cause severe threats to public health and well-being. Anthropogenic disasters pose an especially challenging threat that must be dealt with through vigilance, and proper preparedness and response. Small instances of public lifestyle at times demonstrates how man made disasters are creating imbalance in our ecology; for instance knowingly dumping toxic chemicals into a stream to willfully ignoring the potentially devastating weaknesses of their own facilities, humans have managed to create destruction on earth that rivals the wrath of Mother Nature herself.

An attempt has been made in this research paper to provide information about some major sources of man-made disasters, which ultimately lead to environmental disasters creating widespread destruction to life, property and ecological balance. Such awareness would help to educate and at the same time lead to precaution and ability to deal with such disasters.

Anthropogenic disasters include, but are not restricted to, the following:

1. Bhopal: the Union Carbide gas leak
2. Chernobyl: Russian nuclear power plant explosion
3. Seveso: Italian dioxin crisis
4. The 1952 London smog disaster
5. Major oil spills of the 20th and 21st century
6. The Love Canal chemical waste dump
7. The Baia Mare cyanide spill
8. The European BSE crisis
9. Spanish waste water spill
10. The Three Mile Island near nuclear disaster

Descriptive Study of some common Anthropogenic Disasters and their Impact

Following are examples of very few well known anthropogenic disasters and encompass only a minuscule number. The limitation in containing the length of the research paper does not permit inclusion of greater numbers. The objective is to familiarize the reader about the stark reality of how man made disasters can lead to environmental disasters.

1. Bhopal: the Union Carbide gas leak

December 3, 1984 has become a memorable day for the city of Bhopal in Madhya Pradesh in the country of India. Shortly after midnight, a poisonous gas cloud escaped from the Union Carbide India Limited (UCIL) pesticide factory. The cloud contained 15 metric tons of methyl isocyanate (MIC), covering an area of more than 30 square miles. The gas leak killed at least 4,000 local residents instantly and caused health problems such as odema for at least 50,000 to perhaps 500,000 people. These health problems killed around 15,000 more victims in the years that followed. Approximately 100,000 people still suffer from chronic disease consequential to gas exposure, today. Research conducted by the BBC in 2004 pointed out that this pollution still causes people to fall ill, and ten more die every year. This event is now known as the worst industrial environmental disaster to ever have occurred.

2. Chernobyl: Russian nuclear power plant explosion

On April 26, 1986 tests were conducted in nuclear reactor 4 of the Chernobyl nuclear power plant in Ukraine, located 80 miles from Kiev. These tests required part of the security system to be shut down. Errors in the reactor design and errors in judgment of the personnel of the power plant caused cooling water to start boiling. This caused reactor stress, resulting in energy production increases to ten times the normal level. Temperatures reached more than 2000 °C, causing fuel rod melting and further cooling water boiling. Extreme pressures in cooling water pipes resulted in cracks, which caused steam to escape. At 1:23h in the middle of the night the escaped steam caused an explosion slamming off the roof of the building, starting a major fire and simultaneously forming an atmospheric cloud containing approximately 185 to 250 million curies of radioactive material. Fire and explosion instantly killed 31 people. Two days after the explosion, the Swedish national radio reported that 10.000 times the normal amount of cesium-137 existed in the atmosphere, prompting Moscow to officially respond. The following day over 135.000 people were evacuated from within a 30 km radius of the accident. This area was labeled the 'special zone'. The evacuation of the special zone was permanent, as the high levels of radioactivity have been predicted to exist for several centuries.

3. Major oil spills of the 20th and 21st century

At the end of the 20th century and the beginning of the 21st century there have been oil spills all over the world, caused either by naval accidents or during major wars. It is impossible to determine which of these oil spills had the most severe consequences for its environment. Consequently the research paper describes some of the major oil spills which ultimately resulted in tremendous environmental disasters:

On July 6, 1988 an explosion occurred on the oil and gas production platform Piper Alpha of Occidental Petroleum Ltd. and Texaco in the North Sea. Piper Alpha was located on the Piper Oilfield, about 190 kilometres from Aberdeen in 144 metres of water. There were about 240 people working on the platform. The explosion and resulting fire killed 167 of them. It is now said that evacuation plans were inadequate and therefore failed preventing any of the deaths. By the time rescue helicopters arrived, flames over 100 metres in height and prevented safe approach. Only 62 workers were pulled from the sea alive.

In 1989 the American oil tanker Exxon Valdez clashed with the Bligh Reef, causing a major oil leakage. This caused an oil spill of between 41.000 and 132.000 square meters, polluting 1900 km of coastline. The oil spill killed approximately 250.000 sea birds, 2.800 sea otters, 250 bald eagles and possibly 22 killer whales.

In August 1990 Iraqi forces invaded Kuwait, starting the Gulf War in which an allegiance of 34 nations worldwide was involved. **In January 1991** of the Gulf War, Iraqi forces committed two environmental disasters. The first was a

major oil spill 16 kilometres off the shore of Kuwait by dumping oil from several tankers and opening the valves of an offshore terminal. The second was the setting fire to 650 oil wells in Kuwait. The oil spills did considerable damage to life in the Persian Gulf. Several months after the spill, the poisoned waters killed 20,000 seabirds and had caused severe damage to local marine flora and fauna. The fires in the oil wells caused immense amounts of soot and toxic fumes to enter the atmosphere. This had great effects on the health of the local population and biota for several years. The pollution also had a possible impact on local weather patterns.

Disaster Mitigation

Environmental disasters are catastrophic events that may cause a lot of casualties, injuries and deaths, destruction of human property and disturb ecosystems stability. These may be of natural environmental or human induced origin. However, it is possible to reduce the impact of disasters by adopting suitable disaster mitigation strategies. The disaster mitigation initiatives mainly address the following:

- minimize the potential risks by developing disaster early warning strategies
- prepare and implement developmental plans to provide resilience to such disasters,
- mobilize resources including communication and tele-medical services
- to help in rehabilitation and post-disaster reduction.

Disaster management on the other hand involves

- pre-disaster planning, preparedness, monitoring including relief management capability
- prediction and early warning
- damage assessment and relief management.

Disaster reduction is a systematic work which involves different regions, different professions and different scientific fields, and has become an important measure for human, society and nature sustainable development. Places that are more likely to have natural disasters, such as the earthquake-prone Pacific Ring of Fire, or coastal areas vulnerable to hurricanes, require accurate methods of predicting disasters and warning the public quickly. Once the people have been informed, evacuation routes must be provided so that they can all leave quickly and safely, even if they travel by foot. Emergency warnings and evacuation plans are not enough, though. Where there is a high risk of earthquakes, buildings need to be strong and flexible enough to survive a quake without collapsing. Where hurricanes and flooding are a problem, levees and dams must be strong enough to hold floodwaters, and natural drainage systems must be maintained to allow waters to flow back into the ocean.

The boxing-day tsunami which devastated Indonesia and the 2005 earthquake in Kashmir, Pakistan, were both natural disasters whose effects were

made worse by underdeveloped infrastructure and widespread poverty. Tsunamis, earthquakes, hurricanes or any other natural disaster can't be avoided, but with good preparation and well-organized help after the fact, it is possible to survive and go back to normal life afterwards. The failure of the levee and drainage systems was responsible for most of the destruction and flooding in New Orleans after Hurricane Katrina in 2005. It was the poor planning of evacuation routes and assistance for those trapped by the flooding that resulted in the many tragic fatalities. People need to be educated on the risks in their area, and what to do when a disaster strikes. After a disaster, even if no one has died, there is a lot of damage to people's homes, farms and workplaces that must be repaired. This takes a lot of time and money to fix, and a country damaged by a disaster usually needs a large amount of international help to recoup. Donated food, clothing, medicine and experienced professionals are all important when there is a disaster, but when the emergency is over it can take years to rebuild and make sure that future disasters can be managed.

Conclusion

This research paper has made an attempt to explain that natural as well as man-made environmental disasters have the potential to impact life on earth. The paper also brings forth that many environmental disasters are a result of man-made hazards which can be prevented. It becomes apparent that it is very difficult to rank disasters because there are different ways of defining "worst". For instance some would just count the dead, others would include the injured, still others would measure in terms of the cost required to repair the damages, or somehow calculate the damage to the environment.

Environmental issues are becoming increasingly important as both natural and anthropogenic disasters are ultimately leading to environmental hazards such as global warming, depletion of natural resources, pollution, contamination and degradation. All of which is causing harm to human health, on the proliferation of living organisms, and on the equilibrium of ecosystems, making the environment unfit for healthy human survival. Pollution and contamination causes the physical, chemical or biological properties of the air, ground or water to become unsustainable and which may eventually threaten the survival of any form of life on earth.

Scope for future Research

This paper on environmental disasters brings forth the scope for research on subjects such as Disaster Archeology, Risk Assessment of Past Catastrophic Events, Socio-Cultural Profile of Hazards, and Psychoanalytical Study of Impact of Environmental Disasters. All such subjects are critically associated with environmental disasters and further the understanding of disaster management.

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Dr Renu Bhargava is Director of Indira School of Business Studies, Pune, India.
Email: renu_60_9@hotmail.com
