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The Implications of Manmade Disasters on Human Life and Climatic Conditions – Case Analysis of Chernobyl 1986 and Bhopal 1984

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Abstract:

Purpose: In this paper, we reflect upon the consequences industrial and man-made disasters, mostly resulting in catastrophic reactions and events. Such disasters not only pose immediate threats to human safety, but also have long-lasting impacts on ecological systems and climatic conditions. Two such disasters, Chernobyl in 1986 and Bhopal in 1984, serve as poignant reminders of the devastating effects of human error and negligence.

Design/methodology/approach: A comparative case study approach has been employed to delve deeply into the human and environmental implications of the Chernobyl and Bhopal disasters which involves examining historical records, survivor testimonies (India), and scientific investigations to understand the immediate and long-term effects of these events.

Findings: the interconnectedness between human activities and environmental sustainability, with far-reaching negative implications for climate change and ecological balance.

Originality: This paper adds value to the literature as not many studies have been conducted and compared at this level. By examining the root causes, immediate consequences, and long-term effects of these events, we can gain a deeper understanding of the complex dynamics at play and identify strategies for preventing and mitigating future disasters.

JEL Codes-E1, I1, K4, L5, Q51,Q53,Q54,Q56,Q57,Q58

Keywords: Environment, Climate Change, Health Economics, Sustainability, Government Policy, Regulation & Industrial Policy

Introduction:

Manmade disasters have significant implications for human life and environmental conditions. Understanding the long-term impact of these events is crucial for preventing similar catastrophic incidents in the future. The Chernobyl nuclear disaster in 1986 and the Bhopal gas tragedy in 1984 are two monumental manmade disasters that provide valuable lessons about the consequences of human error and negligence.

As the renowned author Rebecca Solnit once said, “There are disasters that are entirely manmade, but none that are entirely natural”. A disaster is defined as, “a sudden event, such as an accident or a natural catastrophe, that causes great damage or loss of life”. Manmade disasters are recognized to have an element of human intent, negligence, or error involving a failure of a man-made system, that ultimately yields a disaster. Manmade disasters vary in type, from the silent threat of industrial accidents to the devastating consequences of human negligence, these have significant implications for human life and environmental health. The stories of manmade disasters serve as poignant reminders of the fragility of human existence and the impact of our actions on the world around us. Imagine a skyline engulfed in flames, toxic clouds billowing into the sky, and streets flooded with chemical waste. This grim tableau represents just a glimpse of the aftermath of manmade disasters, leaving behind a trail of destruction and despair. What happens when human ambition overrides environmental responsibility? The answer lies in the wake of manmade disasters, where profit-driven decisions often result in irreversible harm to ecosystems and communities.

The aforementioned tragedies are paramount examples of human error and negligence. There was a nuclear gas reaction that occurred on 26th April 1986 in Chernobyl, Ukraine at Chernobyl Nuclear Power Plant, for which Viktor Bryukhanov was held guilty and punished. Officially, this disaster and the repercussions of the mayhem that followed thereafter have ended, but the city continues to act as a reminder of the severity of manmade tragedies, a bustling town now barren and lamented with diseases and toxins in the air.

Prior to the havoc wreaked by Chernobyl, in the quiet town of Bhopal, India, on the night of 3rd December 1984, thousands of people were killed as a chemical gas leak in a Union Carbide India Limited plant had engulfed the city in fumes of toxicity due to human negligence. The repercussions of the Bhopal gas tragedy are still ongoing, direly affecting the impoverished communities that still reside in the vicinity of these fumes, with diminished hopes as their transgressor lived a prosperous life without facing any legal repercussions.

A similar analysis can be conducted on the curious cases of Centralia, United States and Jharia, India. On 27th May 1962, a coal seam fire was reported in the town of Centralia for the first time. This fire continues to burn even today and will likely continue to burn for centuries. Currently, the population of Centralia is estimated to be between 4-10 people, whereas a wealth of the population was compensated by the government for loss of property as well as loss of life. Similarly, in Jharia, India, a coal mine fire was reported for the first time in 1916, a repercussion of wartime unscientific usage and research of these mines before nationalization. Almost hundred years after the first fire was reported, the conditions in which the natives of Jharia coal mines reside have not improved even marginally. The population is estimated to be in thousands, with at least one death or case of acute illness every day as a repercussion of this underground fire.

This essay aims to explore the implications of such manmade disasters on human life and climatic conditions, drawing insights from the Chernobyl and Bhopal tragedies, as well Centralia and Jharia. The paper will present a literature review of the existing knowledge and a methodology for understanding the multifaceted implications of these disasters.

Literature Review:

The implications of disasters in life can not be measured in terms of emotional and psychological well being of any individual, as these accidents are synonymous with having catastrophic effects in quotidian lifestyle. A few of these studies have been referred to in this paper but the material where a comparison has been made and any learnings have been noted are scant. This can be due to the nature of the research or perhaps due to diplomatic reasons.

As per the research conducted by Kashcheev et al (2014) they studied the radiation risks associated with the Chernobyl disaster. The cohort said that no increase in the mortality from all cancers among the emergency workers as compared to the baseline mortality in Russian men was found. Whereas in a previous study by Ron (2007) he mentioned that "As a result of the Chernobyl nuclear power plant accident, massive amounts of radioactive materials were released into the environment and large numbers of individuals living in Belarus, Russia, and Ukraine were exposed to radioactive iodine, primarily 131I. Iodine-131 concentrated in the thyroid gland of residents of the contaminated areas, with children and adolescents being particularly affected. In the decade after the accident, a substantial increase in thyroid cancer incidence was observed among exposed children in the three affected countries, and compelling evidence of an association between pediatric thyroid cancer incidence and radiation exposure to the thyroid gland accumulated." The medical inferences have been increasing ever since for the people who lived in these contaminated areas during the disaster and even post for a certain time period.

In an article by NRC (Nuclear Regulatory Commission) in 2018, "Closing Chernobyl's reactors required a combined effort from the world's seven largest economies (the G-7), the European Commission and Ukraine. This effort supported such things as short-term safety upgrades at Chernobyl Unit 3, decommissioning the entire Chernobyl site, developing ways to address shutdown impacts on workers and their families, and identifying investments needed to meet Ukraine's future electrical power needs."

A very striking research done by Malcom (1997) on the tenth anniversary occasion of the Bhopal Gas Tragedy mentioned – " There are striking similarities in between the two disasters – Bhopal Gas Tragedy and Chernobyl. At Bhopal, capital of Madhya Pradesh in central India, in the early hours of December 3, 1984, an explosion occurred at Union Carbide of India Ltd (UCIL)'s methyl isocyanate (MIC) plant. Some 40 tonnes of a complex chemical mixture were released, causing several thousand deaths and hundreds of thousands of injuries. At Chernobyl in the north of Ukraine, then part of the USSR, in the early hours of April 26, 1986, an explosion at a state-owned nuclear power plant caused the release of some 6 tonnes (possibly more) of radioactive materials. The 'immediate' death toll was much lower than at Bhopal. Both accidents involved highly technical industrial processes and plant which were set in relatively backward regions."

The globalised world is facing a climatic warning in various countries and there is a global emergency to curb down the global warming. This will help the human population to reduce the climatic effects of emissions and restore the natural balance. The least we can do is to control the increased implications of these man-made disasters on climate change. As mentioned by Chu et al (2017), the release of toxic substances and the destruction of ecosystems can lead to environmental degradation, impacting air and water quality, soil fertility, and regional climates. They also wrote that "understanding, measuring, and managing today's human environmental impacts – the most important consequence of which is the impoverishment of living systems – is humanity's greatest challenge for the 21st century." The catastrophic and far-reaching effects of a nuclear power plant catastrophe were made evident by the Chernobyl tragedy. In addition to causing immediate casualties, the release of radioactive elements contaminated the environment and resulted in long-term health problems. Bhopal, on the other hand, brought to light the perils of lax safety regulations and the catastrophic effects that leaks of industrial chemicals may have on local ecosystems and human health.

Research Methodology:

Data on the Chernobyl and Bhopal disasters will be collected from reliable sources, including academic journals, government reports, and reputable online databases. The focus will be on epidemiological studies, environmental impact assessments, and health surveys of affected populations and the effects upon the climatic conditions for future generations. The collected data will be analysed to identify patterns and trends in the implications of these disasters.

A case study approach will be employed to delve deeply into the human and environmental implications of the Chernobyl and Bhopal disasters. This will involve examining historical records, survivor testimonies with photographs of actual site (India), and scientific investigations to understand the immediate and long-term effects of these events. By comparing and contrasting the outcomes of these two disasters, valuable insights can be gleaned about the different types of manmade calamities and their varied repercussions. Based on the literature review, the following research questions have been projected –

RQ1 – What are the implications of these disasters on human health along with social, economic, and physical environment?

RQ2- What are the lessons that global organizations have learned from this and what were the technical and operational errors incurred by the authorities and the victims?

Both quantitative and qualitative data, such as health statistics and environmental contamination levels, and qualitative information, including personal narratives and sociocultural impacts, will be analysed. This mixed-methods approach will enable a comprehensive evaluation of the implications of these disasters on human life and climatic conditions.

Findings:

Bhopal Gas Tragedy- History and Analysis:

The Bhopal gas tragedy occurred on the night of December 2-3, 1984, at the Union Carbide India Limited (UCIL) pesticide plant in Bhopal, India. The parent company, Union Carbide Corporation (UCC), was the seventh largest

chemical company in the United States, and it formulated a division in Bhopal in 1969 as a planned expansion. This disaster, however, was a culmination of factors including operating errors, design flaws, maintenance failures, training deficiencies, and cost-cutting measures that were detrimental to safety. The release of at least thirty tonnes of methyl isocyanate (MIC) gas resulted in the immediate death of thousands of people and affected over 600,000 workers.

Some of the operations at UCIL relied heavily on using potentially hazardous chemicals within a very densely populated part of the city, but as the plant was only meant for formulation and the mixing of stable substances to make pesticides, it was deemed and accepted that it did not characterise a major risk to local people. Alternatively, the side effects of pesticides and MICs were not known widely in the public domain at the concerned time. Though it is not a member of the cyanide family, it could be associated with a range of serious medical conditions, especially affecting the eyes, skin, respiratory tract and immune system (Smyth, 1980). There were suggestions that UCC had carried out research which had not been made public, and that work done by various national Governments had been kept secret owing to the potential use of MIC in chemical weapons (Delhi Science Forum, 1985). The local authorities objected to the use of MIC but UCIL was a powerful corporation and the authorities were made to believe that it is a non-fatal gas. Furthermore, it is to be noted that there was no immediate-relief antidote for this gas.

Minutes leading to disaster –

- Flushing operation started (separating water from pipes as it reacts with MIC)

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- No one on Slip Blind duty to stop water from entering storage unit (supervisor wasn't aware)

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- Water flowed downhill to tank E610 and further down to blow down valve (which should have been closed)

↓

- Water enters E610 and starts reacting with MIC

↓

- Tank E610 had not been pressurised for six weeks

↓

- At 23.30 a leak of MIC and dirty water was detected near the scrubber.

↓

- By 00.15 on December 3 the pressure in tank E610 had reached 2 atmospheres, outside the normal range

↓

- Hissing sound started from tank E610, meaning it was open.

↓

- Disaster struck.

Analysis Bhopal :

Human errors –

Bhopal is the capital city of Madhya Pradesh, located in central India. Akin to the nature of a quaint and quiet town, Bhopal is lauded for its tranquil lifestyle and bucolic nature, including a lake that is the kernel of the entire city. The UCIL plant was installed with the hopes of generating income and employment for the population surrounding the plant. The employees relied largely on the training module supplied by the plant before starting the employment, as it was a chemical factory. But, not surprisingly, few of the workers were hired on urgent basis with zilch training provided. This could be one of the major human errors of the tragedy as the maximum capacity of the plant was reliant on manual functions. Lack of safety measures, unsafe practices and language barriers were not taken into account. The instructions provided to the labourers were predominantly in English, which was a constraint for maximum employees as it curtailed their understanding of the same.

Untimely reduction in the staff and absence of an engineer was not well communicated to the workers present during the shift. Additionally, the lack of proper communication channel also caused major delays. The emergency situation was not well coordinated, and even more appallingly, the communication was done manually in the midst of the chaos. Due to the monumental absence of any emergency plan, or apt training for an emergency situation, the entire plant had been thrown into pandemonium, with hundreds of people running haphazardly and a handful of coordinators trying to contain the disarray. The abiding fact remains that the workers of the factory were deliberately misinformed about the severity of the gas that they were handling, and moreover, their employers failed them by not equipping them with the required knowledge to subdue an emergency situation.

Technical and Operational errors-

The plant was already running into losses, but the international management did not give much importance to this particular site. Even the local authorities at the site were keen on the aspect of new job opportunities for the local people, thereby their central focus was to employ labour force irrespective of the health and safety protocols.

Alas, the policy measures were framed eloquently and robustly, but the implementation in the hands of the local authorities yielded trivial results because no one was actually following the policies or even taking apt corrective measures. Operational deficiencies were largely ignored and the lack of contingency plan during emergencies overall increased the impact of the disaster.

Lack of training programs and personnels was also a huge drawback, along with ignorance from the managerial authorities. The design of the plant and its location, which was near a highly inhabited area, was a lag from the organisational standpoint. The storage of large amounts of MIC in the tanks and some units in the tank which should have been empty during the disaster was overlooked by the workers and the authorities. Water could only enter the tank through the blow-down valve or the safety valve. The possibility of a malfunction in the blow-down valve was suggested by the failure in the pressurisation system of tank E610 but was not investigated.

Gases released from the storage tank could not be neutralised or contained as there was no system to contain the gas. The use of corrodible carbon steel rather than stainless steel for pipework was the probable cause of the high concentration of iron ions which aggravated the entire leak.

The entire plant was in ruins but instead of checking and controlling the quality standards, all the authorities played an international blame-game, due to which a large section of the society is still facing the brunt of this disaster. The generations today are also facing health challenges and financial difficulties. Conclusively, it is safe to say that this disaster not only killed families at the concerned time, but it is continuing to kill the generations of those families even today.

A New Delhi-based photojournalist, Jain (2019) visited the site, he went with a certain anger, but also a certain complacency over what's already happened. He quoted , "But when I went, I realised that people got affected not just when the gas leak happened; they're still getting affected, even now." Some pictures taken by the authors as visited in 2023 are also attached to the paper as exhibits.

Chernobyl:

Background

The Chernobyl Nuclear Power Plant is in the northern part of former Soviet Republic of Ukraine, near the borders with Belarus and Russia. At the time of opening, Russia had been campaigning in favour of nuclear electricity generators for a few decades, and more than 40% of the electricity is generated through nuclear power plants. A notable name amongst them was Chernobyl with the RBMK, based on the Obninsk reactor.

"The RBMK is different in principle from any other commercial reactor system in the world, mixing water cooling with a fixed graphite moderator. Water passes through pipes which pass through the core where the nuclear fission takes place. This water boils in the pipes, and the steam produced goes to turbogenerators to create electricity.(Malcolm 1997)".

RBMK was first installed in St. Petersburg in 1974, followed by two more units at different locations. The fourth unit was at Chernobyl which caught fire and exploded in 1986. Following Chernobyl, the installation of the remaining two reactors had been abandoned due to the disastrous outcome of Chernobyl.

Minutes leading to disaster-

- The operators started to reduce power by inserting control rods, which absorb neutrons into the core

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- an operator failed to reset the power regulation system to the desired 700-1 000 MW (th), and as a result the power kept falling

↓

- increased levels of xenon in the fuel; xenon was still being produced (from iodine-135) at 1 600 MW

↓

- increase in xenon poisoning made it much more difficult for the operators to reverse the mistake and bring power back up

↓

- At 01.19 the operators opened the main feed valve, thus increasing the levels of water in the system.

↓

- At 01.21.50 the operator sharply reduced the supply of cold water, and steam began to be produced

↓

- At 01.23. two explosions were heard.

↓

- the first resulted from an interaction between the fuel and the coolant and the second from an explosion between hydrogen and air which had entered the reactor space

↓

- The second explosion was calculated like 480 times the normal operating power of the reactor

↓

- Extremely high radioactive material was strewn around, and the emissions continued until May 5.

Analysis Chernobyl-

Human Errors-

The Chernobyl disaster was an agglomeration of more technical errors and less human errors. Albeit the technical malfunctions, there were a few things that could have changed the course of the disaster, if it had been managed in a trained manner. For instance, the failure of the operator to turn off the reactor system and reset the power on time and the overall structure of the plant was also faulty. The complete ignorance and violations of the organisational rules was another human factor that contributed in the keystone disaster of Chernobyl. The members of the state inspectorate, the Gosatomenergoadzor, had all gone to the local clinic for medical inspections on April 25, so nobody was on site to prevent breaches of the operating code (Ignatenko et al., 1989).

It is also believed that the Director of the reactor was unaware of the experiment, and he was informed about it in the middle of the night, when the reactor was already in fumes. The experiment was scheduled for 25th April midday, instead it happened at night when the authorities and the engineers were least alert. Presumably, the operators overrode the commands received from various parts of the reactors and continued the experiment without realising the aftermaths. Not only had the core had caught fire, but the superintendent was not willing to accept the fault and ignorance despite of the fact that all other workers were continuously doubting the functioning of the reactor. This was sheer negligence and ignorance which led to the accident.

Technical and Operational errors-

Chernobyl was considered as the flagship of Soviet nuclear fleet, but it had significant gaps in safety and mindful handling of the reactor. The selection of the operators was not as per their abilities, but as per their political preferences, and this might have led to miscommunication between the authorities and the operators. The lag in communication was a major drawback in the entire accident. The major technical error that surfaced was the design of the plant itself. Apart from providing employment and electricity, it was still built with many malfunctions that too within a populated area. The entire city was wiped out and residents had to leave their homes in order to safeguard themselves from hazardous impacts.

The maintenance structure of the plant was also technically unsound as the temperatures were not chemically perfect for the process to be completed flawlessly. The core cooling system was manual in terms of shutting down rather than being automatic. The plant shut down system or shut off system was also staggeringly slow which aggravated the disaster, and nothing could be done manually after a tipping point. The entire plant lagged in security and safety parameters, but no action was taken on time in order to prevent any such disaster. The team was also not adequately equipped to control safety rods and panels and avoid the spread of the gaseous substance from the plant. Such nuclear waste is still harmful, and the impact of the leak can still be felt in the flora and fauna of the region.

(PART II: Centralia and Jharia)

Centralia:

Centralia is a town located in the Colombia county of Pennsylvania, United States. This near-ghost town was established in 1866, with a population of circa 2500 who settled in the same year. Centralia is located in the vicinity of the Buck Mountain coal bed, with an intricate honeycomb of coal seams and underground tunnels running under the town. On May 27th, 1962, a fire was reported in Centralia to the local authorities. This fire has been burning for more than sixty years, and it will likely burn for 250 years, or more. Although the exact cause of the fire is unknown, it is believed that the underlying anthracite coal seam had been ignited unintentionally by workers who were routinely cleaning the city by cleaning up the landfills. The trash fire was ignited in the pit, but due to a network of interwoven underground tunnels and coal seams, the fire travelled through the mines and ignited a seam of coal. Initially, in the 1960s, 1970s, and 1980s, the fire had been burning from “four fronts”, but now it appears to be burning only from two fronts. However, the fire in the “first front” is advancing at a rate of 20m/year.

Efforts to extinguish the fire or mitigate its spread have been largely unsuccessful, and it continues to burn to this day, causing the abandonment of the town due to health and safety concerns related to toxic fumes and the instability of the ground above the burning coal seam. Although the first fire had been reported in 1962, the government-initiated evacuation only in 1984 after a group of teenagers fell into an open pit, succumbing to the flames of the inferno underneath their hometown. Between 1985-1992, the central government had allocated $42 million dollars to the residents of Centralia, PA, to be congruous with re-location efforts. Although a profusion of the population had accepted the appropriation, some families continue to live in the town of Centralia even today. In 1992, the State declared eminent domain in Centralia.

Eminent domain is defined as, “the right of a government or its agent to expropriate private property for public use, with payment of compensation”. Minefire emissions have completely engulfed Centralia, turning it into a wasteland. With the aid of several studies and scientific research efforts, forty-five organic and inorganic molecules have been identified in the atmospheric sphere of Centralia, notably toxins such as the greenhouse gases carbon dioxide and methane, as well as other poisons such as xylene, toluene, benzene, and carbon monoxide. The levels of toxicity in Centralia are still hazardous, and plethora of residents of this inferno can be distinctly recognized by their cough. Akin to the symptoms of black lung, people that have inhaled the poisonous air of Centralia are victims to “the worst cough in the world”, even worse than a smoker’s cough. As explained in the re-telling of a former Centralia resident, “If you went to a nearby store and you heard the cough, odds are they were from Centralia”.

Jharia

Jharia is a remote neighbourhood located in the Dhanbad district of Jharkhand, India. Dhanbad is known as the coal capital of India, whereas Jharia powerhouses the maximum power supply in most of India. Although Jharia's population cannot be exacted today, according to the Census of 2001, India, more than 80,000 people called Jharia their home. As of 2023, a settlement of over a thousand people lived in the Bastakola region of Jharia, the heart of the underground furnace. 595 spots have been marked as 'dangerous', and of these, 70 spots are marked very dangerous, yet people continue to live in this sinking inferno, as they have for years. The first coal mine fire in Jharia was detected in 1916 in XIV seam of Bhowrah Colliery, but the exact period of when and how the fire started is unknown.

The most likely reason is that a coal seam caught fire due to unstandardized and unscientific research conducted in the pits before nationalization of Jharia coal mines, which triggered the combustion of the hypogeal coal bed. The authorities have already spent over $27million (Rs. 2311 crores) in attempts to douse the fire and relocate the thousands of people scattered across the town in various small settlements. As per the Jharia Master Plan introduced by the Jharia Rehabilitation and Development Authority, 79,000 families were supposed to be relocated to Belgaria, another neighbouring town, out of which only 4,049 families have been successfully rehomed. The Dhanbad district authorities have also noted that 15,713 quarters were supposed to be made for the people of Jharia, out of which only 7,790 are ready, as of 2021. The families living in these quarters have reported that they meagre work opportunities available in the new district, and the walls in their new quarters have already begun to develop cracks.

Furthermore, akin to Jharia, Belgaria also faces an acute power shortage and water shortage – residents of these localities are lamented by the fact that they get a stable supply of drinking, sanitized water only on alternative days, sometimes even over a span of a couple of days. Much of the population at Jharia lives in destitution, earning their livelihood as manual laborers employed on a day-to-day basis. Although not much has been published on this matter, it can be assumed that Jharia is engulfed with toxic gases due to the oxidisation of minerals, namely vapors such as carbon monoxide, sulphur dioxide, nitrogen oxide, volatile organic compounds, and particulate matter. These pollutants are released in the air during the incomplete combustion of coal and other fossil fuels. Furthermore, these toxins are acutely dangerous for human health, as they are known to be benefactors of respiratory issues, cardiovascular problems, and other serious health issues. Additionally, the combustion of coal can release trace amounts of heavy metals such as mercury, arsenic, and lead, which can pose health risks even at low concentrations. Ergo, the expected life expectancy of the people of Jharia is between 50-55 years, which in itself is contingent on the fact that people do not fall into an open-mouthed furnace as the ground continually sinks lower. Land sinking from coal fires has become a typical occurrence in Jharia as a result of the flames raging underground. Mining-induced subsidence is a year-round phenomenon caused by several reasons, including coal fires, seepage of rainfall into mines, and disturbance from settlements above the burning mines. By on-lookers, the cracks in the roads of Jharia as a result of land subsidence have been described as if it was "the portal through hell".

Combined Analysis Table:

Chernobyl	*Bhopal Gas Tragedy*
-Nuclear gas reaction	-Chemical gas leak
-26 April 1986	-2 December 1984-3 December 1984
-Chernobyl, Ukraine	-Bhopal, India
-Problem: Nuclear reactor unit 4 started burning due to mismanagement and under-trained personnel conducting a test, leading to an explosion and fire that demolished the reactor building and released large amounts of radiation into the atmosphere	-Problem: Union Carbide Corporation workers were not trained properly due to which one failed to insert a physical safety device thereby causing the direct entry of water into Tank 610 through a hose connected to the tank, which led to 40 metric tons of MI gas that leaked into the air
-Gas Leaked: Xenon, iodine-131, cesium-134 and cesium-137	-Gas Leaked: Methyl Isocyanate
-Officially released death toll "31 people"	-Officially released death toll "2,259"
-Environmental repercussions are ongoing	-Repercussions are ONGOING

- Viktor Bryukhanov was held guilty	-Union Carbide executive members were blamed officially, but nobody was punished

Centralia	*Jharia*
-Coal seam fire	-Coal seam fire
-First fire reported on 27 May 1962	-First fire reported in 1916
-Centralia, United States	-Jharia, India
-Fire started: Workers started burning trash at a strip mine and set off the burning coal mines underground	-Fire started: Unscientific usage and research of mines before nationalization
-Officially released death toll "111 people"	-Ongoing deaths, several unreported
-The fire is ongoing, it has burned for 60 years and is expected to burn for 250 years or more, with threat to environmental health and adverse habitation loss	-The fire has been burning for 100 years already, and has caused land sinking and release of toxic gases into the atmosphere, along with threat to human life
-4-10 people still officially reside in the town	-Circa 80,000 (As of 2001)
-Since it was set off unintendedly and unknowingly, nobody was held responsible for the fire	-Nobody blamed yet, as official investigations were not recorded when the first fire was detected

Conclusion:

Manmade disasters have enduring implications for human life and environmental well-being. By studying the Chernobyl and Bhopal tragedies, we can gain insights into the complex and interconnected consequences of such catastrophic events. The combination of a thorough literature review and a comprehensive methodology will allow for a nuanced understanding of the implications of manmade disasters, providing crucial lessons for disaster preparedness, risk mitigation, and public health policies.

The Chernobyl nuclear disaster stands as one of the most significant incidents in the history of nuclear power. On April 26, 1986, a series of errors and design flaws led to a catastrophic meltdown at the Chernobyl Nuclear Power Plant in Ukraine, releasing radioactive material into the atmosphere. The immediate aftermath was a human tragedy, with lives lost, communities displaced, and widespread contamination of the environment. However, the legacy of Chernobyl extends far beyond its immediate impact, offering crucial insights into the long-term consequences of nuclear accidents on both human health and the environment.

Similarly, the Bhopal gas tragedy, which occurred on the night of December 2-3, 1984, in India, serves as a stark reminder of the dangers posed by industrial accidents. A leak of methyl isocyanate gas from a pesticide plant owned by Union Carbide Corporation resulted in the deaths of thousands of people and left countless others suffering from debilitating health issues. The Bhopal disaster not only highlighted the importance of industrial safety standards but also raised questions about corporate responsibility and accountability in the face of such catastrophes.

As it becomes evident that they are not isolated incidents but rather manifestations of broader systemic failures in risk management, regulation, and crisis response. Moreover, they underscore the interconnectedness between human activities and environmental sustainability, with far-reaching implications for climate change and ecological balance.

In this paper we will explore the multifaceted impacts of manmade disasters on human life and climatic conditions, drawing valuable lessons from the tragedies of Chernobyl 1986 and Bhopal 1984. By examining the root causes, immediate consequences, and long-term effects of these events, we can gain a deeper understanding of the complex dynamics at play and identify strategies for preventing and mitigating future disasters. Through this analysis, we can chart a path towards a more resilient and sustainable future, where the lessons of the past guide our actions in safeguarding both human well-being and the integrity of our planet.

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