Research article

From Calamity to Sustainable Development: A Critical Analysis of Disaster Management in Ancient India

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Abstract

The environmental crisis is one of the most significant dangers that humanity faces today. Ancient Indian Sanskrit literature, Buddhist traditions, and Jain textual sources serve as vast reservoirs of knowledge about environmental discourses. This study delves into the realm of disaster management in ancient India, exploring the intricate relationship between natural calamities and sustainable development through a critical analysis of normative literature, including the *Arthaśāstra, Skānda-Purāṇa*, and *Mārkaṇḍeya Purāṇa*, etc. as well as creative literature like *Daśakumarcharita, Adbhuta Sāgara,* and epigraphical sources such as the Mahasthan Inscription and Sohgaura Bronze Plaque Inscription. This paper will examine the concept of calamities and how these normative and creative texts fostered the idea, while also exploring how these texts contributed to the notions of disaster management and sustainable development. This analysis reveals that ancient Indian societies developed a nuanced understanding of disaster management, encompassing prevention, preparedness, response, and recovery. This paper examines the role of governance and environmental factors in shaping disaster management strategies and how fear of calamities generates social anxiety among ancient Indian societies. The paper, therefore, aims to explain the concepts of disaster management and sustainable development as practised by ancient Indian societies—activities that reflect a profound understanding of the relationship between nature and humanity, rather than presenting a homogeneous idea.

Keywords: Environmental Jurisprudence, Ancient India, Disaster Management, Sustainable Development.

SUSTAINABLE DEVELOPMENT G☀️ALS [**Climate Action**](#)

Introduction

The environment has played a crucial role in the historical progress of every human civilization. The disaster is an environmental phenomenon. The term 'disaster' originates from the Middle French word 'désastre', which stems from the Old Italian 'disastro'. This, in turn, is derived from the Ancient Greek prefix 'dis'- meaning 'bad' and 'aster' meaning 'star'. The etymology of the word 'disaster' is rooted in an astrological belief, attributing calamities to the positioning of celestial bodies (Srivastava, 2011, p. 1). A disaster refers to an event or a sequence of events

that disrupts the functioning of a community or society, causing human, material, economic, or environmental losses that exceed the community's or society's capacity to manage with its resources. While disasters are often triggered by natural forces, they can also arise from human actions. A disaster occurs due to the interplay of hazards, vulnerabilities, and the inability to mitigate potential adverse outcomes. It is sometimes characterized as a "catastrophic scenario where the usual patterns of life or the ecosystem are disrupted, necessitating extraordinary emergency measures to protect and preserve lives or the environment" (Srivastava, 2011, p. 1). According to the United Nations, a disaster is defined as "the occurrence of sudden or significant adversity that disrupts the essential fabric and normal operations of a society or community" (Srivastava, 2011, p. 1-2).

Ancient Indian literature serves as an extensive repository of knowledge encompassing all aspects of the environment. Normative and creative texts, along with epigraphical records, provide numerous examples of strategies for managing both natural and human-induced disasters, including invasions, wars, droughts, floods, famines, earthquakes, and cyclones. Such calamities impact communities as a whole, causing harm not only to human lives, wildlife, and the environment but also to social structures, material assets, and the economy. The geographical position of the Indian subcontinent, with its expansive boundaries and distinctive geoclimatic features, presents an intriguing combination of susceptibility and resilience. Due to its geographic location, India has consistently been vulnerable to natural and anthropogenic disasters. Over the centuries, people have adapted to frequent challenges by developing unique settlement patterns, livelihood strategies, socio-cultural customs, and traditional practices. Early Indians appeared to live in harmonious coexistence with nature. Evidence of India's environmental history can be traced back to the protohistoric Harappan civilization (Rajak, 2019, p. 134). The Vedic, Jain, and Buddhist textual traditions laid down the principles of ecological balance, environmental management, conservation, and protection. The Aśokan edicts, dating to the 3rd century BCE, stand as the earliest constitutional measures against environmental degradation and cruelty to animals (Giri, 2018, pp. 61-65). Visitors to India, such as Megasthenes, Pliny, Ptolemy, Fa-Hien, Hiuen Tsang, and Itsing, documented various practices of environmental preservation during their respective periods (Patra, 2016, 40). In the early stages of human history, the environment played a pivotal role in shaping human activities and lifestyles. Historical records reveal that people were deeply connected with nature and its resources.

In India, the notion of systematic disaster management has existed since the Vedic period. However, the term 'management' gained prominence during the modern era with the onset of industrialization towards the end of the 19th century and the beginning of the 20th century (Arya, 2023, p. 57). Disaster management is an ongoing and comprehensive process that involves planning, organizing, coordinating, and executing measures essential for prevention, mitigation, capacity building, preparedness, rehabilitation, and reconstruction. Sustainable development refers to fulfilling the needs of the present without jeopardizing the ability of future generations to meet their own needs (Pathak and Pandey 2023). Ancient Indian normative and creative literature, along with epigraphical records, also reflect concepts of sustainable development. This paper seeks to explore some of the disasters and their management approaches as outlined in ancient Indian normative and creative texts, as well as epigraphical records, and to examine how ancient Indian societies promoted sustainable development.

The Concept of Calamities in Ancient India

Alongside normative texts emphasizing the importance of harmony between humans and the environment, scholastic and creative writings in ancient India addressed aspects of disaster preparedness and mitigation. Since ancient times, natural calamities such as earthquakes, droughts, cloudbursts, and floods have been frequent in the Indian subcontinent. In the *Vedas*, terms such as *duḥkha, nipāta, pīḍana, āpatti/vipatti,* and *vyasana* were used to denote calamities or disasters. According to the Sāṅkhya philosophical system, calamities can be categorized into three types: *Ādhyātmika, Ādhidaivika,* and *Ādhibhautika. Ādhyātmika* calamities refer to those caused by physical or mental afflictions, including diseases and epidemics. *Ādhidaivika* calamities are natural disasters such as floods, fires, earthquakes, tsunamis, and storms, while *Ādhibhautika* disasters arise from human actions (Arya, 2023, p. 57). The great epics, the *Mahābhārata* and the *Rāmāyaṇa*, contain accounts of extraordinary natural phenomena, some of which can be identified as disasters.

Both the Mahasthan Fragmentary Stone Plaque Inscription and the Sohgaura Bronze Plaque Inscription (both dated c. 3rd century CE) use the term *atiyāyika* to refer to an emergency or calamity. *Atiyāyika* signifies a state of urgency requiring immediate assistance without any delay (Basu Majumdar, 2023, p. 73). It is noteworthy that the term *atiyāyika* also appears in the *Arthaśāstra* (c. 300 BCE- 200 CE) (Kangle I, 1960, p. 204) and Aśokan Major Rock Edict VI. In contrast, the *Dharmaśāstra* (c. 4th or 3rd century BCE to the 6th century CE) employs the term *āpad/āpaddharma*. The word *āpad* signifies calamity, hardship, difficulty, danger, misfortune, distress, or adversity, while *āpaddharma* refers to the code of conduct permissible only during times of distress (Basu Majumdar, 2023, p. 76). Over time, the understanding of disasters and their management became increasingly intricate. By the 4th century CE, the *Kāmandakīya Nītisāra* (c. 500–700 CE) provides a more comprehensive classification of disasters. This text enumerates 15 categories of disasters, including those caused by excessive rainfall, drought, locust infestations, rats, mice, parrots (and other crop-destroying agents), unjust taxation, unlawful punishment, foreign invasions, theft and robbery, failure to manage royal ministers, epidemics, diseases affecting humans, and ailments impacting cattle (Dutt 1896).

The *Arthaśāstra*, a treatise on governance and public administration, encompasses a wide range of topics, including economic policies, military strategies, laws, ethics, and more. In addition to these areas, the manuscript also addresses the effective management of both natural and human-induced disasters. According to Kauṭilya's Fourth Book, disasters are classified into two categories: *daivapīḍanam* (natural disasters) and *mānuṣamapīḍanam* (manmade disasters). *Daiva* translates to divine and, in the present context, refers to natural disasters. *Daiva* is understood as an act of God, occurring due to astrological influences or unfavourable celestial alignments (*Arthaśāstra*, 8.4.1). There are eight types of *daiva* or natural disasters: *Agni* (caused by fire), *Udaka* (floods), *Vyādhi/maraka* (epidemics or diseases), *Durbhikṣha* (drought), *Mūṣaka* (infestations caused by rats), *Vyāla* (attacks by wild animals or beasts), *Sarpa* (snake bites), and *Rākṣasa* (calamities caused by demons or evil spirits) (Kangle II, 2010, p. 262). Conversely, *Mānuṣam vyasana* (manmade disasters) refers to misfortunes arising from human actions or flawed policies. In the case of *Mānuṣam vyasana*, human activities are directly responsible for the resulting casualties. There are three types of *Mānuṣam* disasters: *Suddhapatti* (threats from treachery or enemies), *Amisra* (threats from allies who are either treasonous or non-treasonous), and *Paramisra* (threats when allies and enemies unite). (*Arthaśāstra*, 8.1.1-2 and Sharma, 2017, p. 5345).

A large corpus of Sanskrit writings addresses natural phenomena, with discussions on the causes of earthquakes being a recurring topic in ancient Indian literature. The *Adbhuta Sāgara*

of Vallālasena (10th–11th century CE) presents the view of Kashyapa, who suggested that earthquakes were caused by the movements of sea creatures. Garga, on the other hand, proposed that earthquakes resulted from the sighs of elephants bearing the earth. Another perspective attributed earthquakes to random or unseen forces (Sharma, 1905). Both the *Bṛhat-saṃhitā* by Varāhamihira (5th–6th century CE) (Bhat, 1981) and the *Adbhuta Sāgara* include an explanation from Parashara, stating that, in ancient times, mountains were capable of flying and moving. These mobile mountains would frequently fall to the ground, causing repeated earthquakes (Iyengar, 1999, p. 1). Furthermore, commentaries on the *Bṛhat-saṃhitā* reveal Parashara's belief that eclipses and planetary irregularities could also be responsible for earthquakes (Iyengar, 1999, pp. 1-2). Additionally, a Kannada text, *Lokopakārakam* (c. 1025 CE), written by Cāvuṇḍarāya Rāya under the patronage of the Chāḷukyan king Jayasimha, provides a cross-referenced perspective (Iyengar, 1950). This work includes eight stanzas describing four types of earthquakes. For the *Vayu*-type earthquakes, Cāvuṇḍarāya identifies the affected regions as Kurumagadha, Magadha, Dravida, and Kuntala, equating Dravida with Tigula deśa (Tamil Nadu) in his commentary. For *Agni*-type earthquakes, the regions listed include Anga, Vanga, Kalinga, Kerala, Bahlika, and Dravida. *Indra*-type earthquakes are said to impact only Saurashtra and Abhisara, while Varuna-type earthquakes affect Videha, Govardhana, Nishadha, and Vihara. Notably, all the regions mentioned in the text are recognized today as seismically active zones. It is particularly significant to note that Dravida (Tamil Nadu), Kuntala (North Karnataka), Ashmaka (Maharashtra), Andhra, and Odhra (Odisha) were historically regarded as regions prone to varying levels of seismic activity (Iyengar, 1999, pp. 3).

A significantly quantitative approach to earthquakes is also reflected in the ancient writings. *Vayu*-type earthquakes were regarded as the most destructive. Views diverged on the remaining three types. Some believed that *Agni*, *Varuna*, and *Indra*-type earthquakes were progressively less harmful in that sequence. Vallālasena, in his *Adbhuta Sāgara*, first refers to the *Bhargaviya*, a text that likely predates the *Bṛhat-saṃhitā*. According to this source, the magnitude of ground shaking during a *Vayu*-type earthquake spans 200 *yojanās*. The corresponding figures for *Agni, Indra*, and *Varuna*-type earthquakes are recorded as 90, 80, and 70 *yojanās*, respectively. It could be inferred that this hierarchy reflects the decreasing social impact associated with the four types of tremors. Varāhamihira concurs with only the first value, but for the other three, his measurements are *Varuna*-type 180 *yojanās*, *Indra*-type 160 *yojanās*, and *Agni*-type 110 *yojanās* (Iyengar, 1999, pp. 3-4). No details are provided regarding the methods or instruments used to derive these measurements. Varāhamihira's method of classifying earthquakes based on the extent of ground shaking reflects an impressively scientific approach. Despite the limited information available, it remains highly significant.

Certain primary catastrophes can lead to urban calamities and suffering, such as epidemics and famines, which arise as the aftermath of natural disasters like floods and droughts. These secondary catastrophes have a lasting impact on society and human lives. Often, famines are named after the specific location where the crisis originated. For example, the text *Meṇdakāvadāna* mentions famines categorized into three groups: *Cañcu, Śvetāsthi,* and *Śalākavṛtti*. Among these, the first refers to a place name and is also recorded in the Sohgaura bronze plaque inscription (c. 3rd century BCE) (Basu Majumdar, 2023, p. 75). The Sohgaura inscription indicates the preparedness of the central administrative office in Magadha, which undertook measures to address an anticipated famine situation in and around Sohgaura, located in the present Gorakhpur district of Uttar Pradesh. To manage this emergency, the Mauryan metropolitan administration implemented appropriate measures and made

necessary arrangements. The disaster seems to have originated in Cañcu and was so significant that it came to be known as *Cañcu* (Grierson, 1907, pp. 683–5). Similarly, in Early Bengal, the Mahasthan fragmentary stone inscription (c. 3rd century BCE) from the present-day Bogra district in Bangladesh provides evidence of famines caused by natural calamities in Puṇḍranagara (Sircar, 1993, pp. 79-80). This reflects the actions taken by the authorities following floods to address the calamity or the consequences of the flood.

Sanskrit writings from Ancient and Early Medieval India are abundant in information concerning earth sciences. The *Prabhāsa-kṣetra-māhātmya* (c. 9th century CE), traditionally regarded as part of *Prabhāsa Khaṇḍa* of the *Skanda-purāṇa*, can be treated as an independent traditional Sanskrit text and includes intriguing accounts of ancient natural catastrophes affecting the Kutch-Mt. The Abu region of India. The *Prabhāsa-kṣetra-māhātmya* appears to focus on the area around Prabhāsa (Iyengar, 2004, pp. 11-12). In popular understanding, Prabhāsa is presently associated with the renowned pilgrimage site of Somanātha on the western coast of the Saurashtra region. However, contemporary scholars have suggested that the original Prabhāsa was likely situated closer to the Kutch region. The text offers a folkloric depiction of a natural calamity, accompanied by a famine, possibly linked to a meteorite impact and/or the desiccation of the river Sarasvati. Chapter 129, titled *Akṣamāleśvara-māhātmya-vaṃanam*, narrates a dialogue between sages and a Candāla. The sages justify their act of seeking food from a lower-caste individual as a desperate measure to save their lives, deeming it acceptable under such circumstances. They reference instances such as Sage Bharadwāja consuming beef, and Viśvāmitra and Vāmadeva consuming dog meat when survival was at stake. Ultimately, the Candāla agrees to provide sustenance for a year, on the condition that the most distinguished sage among them consents to marry his daughter. Though the sages are initially mortified, they acknowledge the fairness of the demand. Consequently, the foremost sage, Vasiṣṭha, marries Akṣamālā, the virtuous daughter of the Candāla, who later achieves distinction as Arundhatī through her spiritual prowess. Among the various geographical details, the text mentions a dried river named Citrāpatha near Prabhāsa, visible only during the monsoon (*Akṣamāleśvara-māhātmya-vaṃanam*, 129.5-7 and Iyengar, 2004, pp. 26-27). This famine is also elaborated upon in the *Śānti-pavan* of the *Mahābhārata* (c. 4th century BCE-4th century CE), where the depiction is one of extreme and dreadful famine. According to the account, sage Viśvāmitra, driven by unbearable hunger, resorted to stealing dog meat during this calamity.

The text describes five distinct natural phenomena, firstly, the descent of celestial objects and their penetration into the earth. Secondly, the retreat of the coastline. Thirdly, the swelling of the sea, resulting in extensive loss of life. Fourthly, a terrestrial fire is considered responsible for the desiccation of the River Sarasvati and a severe famine (Iyengar, 1999, p. 30). However, a reader of the *Prabhāsa-kṣetra-māhātmya* can infer that a textual tradition exists suggesting that the north-western region of India experienced a major natural catastrophe. It may be conjectured that this disaster could have been the catalyst for significant population migration out of this area. As a result of these devastating natural events, the displaced population might have established a new settlement bearing the same name along the southwestern coast of present-day Saurāṣṭra. Furthermore, they may have symbolically designated a nearby river as Sarasvati, possibly in memory of the original river.

Between the 6th and 9th centuries CE, the Deccan region, particularly Vidarbha, experienced significant environmental changes. Daṇḍin, in his *Daśakumārcarita* (7th century CE), vividly described a devastating famine that wreaked havoc across the entire Peninsula and may have contributed to the disruption of settlements in this area (Wilson, 1846, pp.1-19). The

Mārkaṇḍeya Purāṇa (6th to 7th century CE) (Partiger, 1904) highlights the intensity of a prolonged drought that affected human habitation and includes references to goddess Śākambharī, depicted as the protector of humanity during times of famine and natural disasters. This catastrophic natural event that struck the Deccan likely had a severe negative impact on human settlements in Vidarbha (Coburn, 1980, pp. 341-352). The aftermath of this famine is also reflected in the writings of Rājaśekhara's *Kāvyamimaṇṣā* (9th to 10th century CE). However, the famine phase eventually passed, and Vidarbha continued to thrive as a significant centre of learning (Parashar, 2000, p. 40). This indicates that while the famine caused widespread destruction for a time, the land and its inhabitants managed to recover and restore their earlier conditions. Its effects appear to have been temporary. Archaeologists corroborate the famine narrative found in the *Daśakumārcarita* by noting the absence of settlement evidence in Vidarbha during the post-Vākāṭaka period.

Disaster Management and Sustainable Development in Ancient India

The unpredictable nature of natural calamities and the resulting disruptions to the natural flow of society gave rise to awareness about disaster management policies and the principles of sustainable development in ancient India. Although these notions of recovery from calamities and sustainable developments do not entirely align with the structured policies of modern states, references to disaster management and sustainable development in ancient Indian literature reflect a deep awareness of the disruptions caused by natural disasters. Consequently, various preventive measures are documented in the normative texts of ancient India. The *Atharva Veda* addresses strategies for mitigating drought (*Atharva Veda* 4.22, 2.23.1), while Kauṭilya's *Arthaśāstra* offers comprehensive guidelines on the entire process of disaster management, including preparedness, mitigation, resilience, and rehabilitation, emphasizing both moral and financial support for disaster victims (Olivelle, 2013, pp. 228-231). In early Indian society, state authorities played a pivotal role as proponents of disaster management and sustainable development. Kauṭilya underscores the king's obligation to safeguard his subjects from the consequences of such disasters.

Fire (*agni*) is regarded as a hazard that can arise from meteorological, geological, biological, or celestial conditions. As a result, various preventive measures and regulations were introduced to manage different types of disasters. The responsibility for controlling fire hazards and establishing rules for citizens to reduce the risks associated with fire was assigned to the City Superintendent or the King (Kangle II, 2010, p. 262). Remedies for fire in residential areas, along with punitive measures for those violating fire-prevention rules, are detailed in several *ślokas*. During the summer, cooking was recommended to be carried out outside homes, either under the collective supervision of ten families or while being safeguarded by ten firefighting tools. Roofs constructed from grass or mats were to be removed. Those whose professions involved the use of fire were required to remain stationed in one location. Homeowners were advised to stay near the entrance of their houses without assembling in one area. Indigenous fire-extinguishing tools were to be kept in every household. Noncompliance with these regulations attracted penalties. For instance, if a homeowner failed to act promptly to save their burning house, they were fined 12 paṇas (a silver coin containing one-quarter copper), while tenants were fined 6 paṇas (*Arthaśāstra*, 2.36.23). If the fire was caused by negligence, the penalty was 54 paṇas, and the offender was sentenced to death by fire. In instances where sufficient aid, either monetary or material, was not provided in response to a fire, the punishment was one-quarter of a paṇas. City Superintendents were tasked with enforcing fire-prevention measures by compelling residents to clear inflammable materials

from their homes and ensuring the installation of fire-extinguishing devices in public spaces. Offenders guilty of intentional arson were executed by fire. Additionally, the City Superintendent was instructed to conduct fire worship rituals during lunar transitions, including Bali offerings, fire sacrifices, and blessings (Olivelle, 2013, p. 229).

According to Kauṭilya, disasters caused by water are the most devastating because while a fire might destroy half of a single village, a flood (*udaka*) impacts numerous villages (*Arthaśāstra*, 4.3.6). Consequently, he recommends several preventive measures to mitigate flood situations. During the rainy season, villages located near water sources should relocate to higher ground above the flood level and maintain a stock of hand planks, bamboo poles, and boats. Rescue teams and materials such as gourds, skin bags, canoes, tree trunks, and braided ropes should be kept ready to aid in evacuating people from flooded areas. Those failing to assist with a flood, unless lacking flotation devices, would face a penalty of 12 paṇas (Kangle II, 2010, p. 263). Kauṭilya also underscores the importance of community involvement in rescue operations for flood-affected populations. Moreover, on days marking lunar transitions, he advises citizens to perform rituals dedicated to river worship. Additionally, individuals skilled in mystical practices or well-versed in the Vedas were encouraged to employ spells to counter excessive rainfall. During periods of drought, rituals were to be conducted in reverence to deities like Indra, Gaṅgā, mountains, and Mahākaccha to seek relief from the adverse conditions (Olivelle, 2013, p. 229). Kauṭilya also emphasized that it was the King's duty to prepare for potential drought conditions by establishing food storage and water reservoirs (such as dams) and promoting hunting activities to ensure sustenance during emergencies.

Kauṭilya recognized that diseases or epidemics (*vyādhi/maraka*) constitute a form of disaster that significantly impacts the lives of those affected. Human diseases, according to him, can be treated by physicians using medicines and by thaumaturgic ascetics through pacificatory rites and penances. Victims should undertake specific remedial actions, including bathing at sacred fords, worshipping Mahākaccha, milking cows in cemeteries, burning a headless trunk, and observing a 'gods' night. In cases where diseases or epidemics afflict farm animals, Kauṭilya recommended conducting lustration rites for the stalls and equipment, along with the worship of the deities associated with these animals (Olivelle, 2013, p. 229). A key preventive measure for animal diseases was the practice of Nīrājanā. Nīrājanā, also referred to as Arti, involves the ceremonial waving of light around a deity (Sharma, 2017, p. 5347). This practice symbolizes the purification or cleansing of a place, person, or object, achieved through the ritualistic waving of a lamp, reflecting a deeply rooted religious faith.

The state's role in famine management, as outlined by Kauṭilya, was crucial. Kauṭilya highlights the distinction between famine and disease, emphasizing that while diseases typically affect a specific region and remedies are available, famine impacts the entire country, leading to widespread livelihood loss and societal collapse. To manage disasters caused by famine, Kauṭilya prescribed a range of measures. In the event of a drought (*durbhikṣha*) or famine, the king was advised to first accumulate a stockpile of seeds and food supplies (Kangle II, 2010, p. 263). Subsequently, he should assist the population by initiating projects such as the construction of forts or irrigation systems, like dams, in exchange for food distribution or, in extreme cases, relinquishing control of the affected region. Another option was to seek refuge with allies, implement population reduction or relocation strategies, or migrate with the populace to regions where crops had flourished. Alternatively, the king could direct efforts toward cultivating cereals, vegetables, roots, and fruits near reservoirs or engage in hunting deer, birds, game animals, fish, and other wildlife to ensure food supply. When famine struck, immediate action was necessary to minimize the suffering of the masses (Olivelle, 2013, p.

230). A ruler who failed to handle a famine crisis effectively was expected to relinquish his position. If the government of the affected region could not manage the disaster, it was recommended to seek assistance from friendly foreign governments. To this end, he devised rules and punitive measures for individuals who violated these guidelines, reflecting his comprehensive approach to sustainable governance and disaster mitigation.

Kauṭilya acknowledged that natural disasters such as drought often forced people to resort to consuming unconventional food sources, like *mūṣaka* (rats), which could lead to diseases among consumers (Kangle II, 2010, p. 264). This is why Kauṭilya categorized rats as a natural calamity and prescribed several preventive measures to control their population. To counter the threat of rats, he suggested releasing cats and mongooses. Capturing or killing these animals, or failing to confine dogs (except in the case of foresters), incurred a fine of 12 paṇas. Additionally, he recommended scattering grains coated with the milk of the Snuhi plant or mixed with secret compounds to control the rat population. Instituting a rat tax or performing pacificatory rites by thaumaturgic ascetics was also advised. On the days of the moon's change, rites of rat worship were to be conducted. Kauṭilya's measures also extended to combating locusts, birds, and insects (Olivelle, 2013, p. 230).

Disasters caused by wild animals (*vyāla*) were another significant natural calamity addressed by Kauṭilya. Such animals could pose severe threats to human life. He proposed various strategies for dealing with them, including scattering farm animal corpses treated with a coma-inducing liquid or entrails filled with Madana and Kodrava-grain. Hunters and fowlers were to use concealed cages and pits, while armed men equipped with protective gear were tasked with killing dangerous animals. A fine of 12 paṇas was imposed on anyone failing to assist, while the same amount was offered as a reward to those who killed vicious animals. On the days of the moon's change, rites of mountain worship were to be performed, and similar remedial actions were prescribed for dealing with herds of deer, game animals, flocks of birds, and crocodiles (Kangle II, 2010, p. 264). For dangers posed by snakes, Kauṭilya recommended enlisting experts in poison cures to employ incantations and medicines or organizing collective efforts to kill the snakes. Additionally, experts in the Atharvaveda were to perform magical spells. On the days of the moon's change, rites of cobra worship were mandated. Similar measures were advised for threats from aquatic creatures (Olivelle, 2013, p. 230).

When there is a threat from demons or malevolent spirits (*rākṣasa*), Kauṭilya asserts that individuals well-versed in the *Atharvaveda* or skilled in magical practices should carry out demon-banishing rituals. Additionally, on the days of the moon's change, the king is instructed to organize sanctuary worship rituals, involving offerings such as platforms, umbrellas, food, banners, and goats. During such perilous times, offerings should be made continuously, day and night, accompanied by the invocation, "We offer you the porridge". In all circumstances, the king is expected to act as a fatherly figure, providing support to those afflicted by calamities (Kangle II, 2010, pp. 264-265). Consequently, individuals proficient in magical practices and thaumaturgic ascetics should reside within his domain, receiving the king's honour as they are instrumental in addressing adversities rooted in fate. Once disasters are addressed, the process of mitigation, aimed at reducing risks, commences. His approach was notably comprehensive, as he integrated the preservation of the environment and ecology into the framework of human existence, highlighting its importance as a fundamental aspect of life.

Sustainable development encompasses both social development and economic opportunity on one side and environmental requirements on the other. The almost semi-circular Mahasthan inscription documents, "Take (from the specified store). (There is an) emergency

due to water, i.e., flood. Unhusked rice (for sowing) and, in addition, for those facing severe or extreme emergencies (financial aid, i.e., copper coins from the treasury) are granted or bestowed" (Basu Majumdar, 2023, p. 42). This inscription represents an order issued from Pupdranagara to a local office in the Salvargiya locality, which had been impacted by water, likely a flood. Aid was extended to them in both cash and kind to address the calamity. The original purpose of the record is to relay an order from the Mahāmātra named Dumadina to an official named Taladina in the Salvargiya locality. It states that government aid was dispatched in the form of unhusked paddy (*dhānyikehi*) from the storehouse at Puṇḍranagara and financial assistance in the form of copper coins (*gaṇḍakas*) from the treasury (*koṣa*) (Bhandarkar, 1931-2, pp. 83-91). This measure was taken by the authorities following the flood to address its consequences. The paddy was likely intended for sowing in fields to facilitate future harvests, as farmers would require seeds to resume agricultural activities. In cases of extreme emergency, individuals could specify their difficulties and request financial assistance, which was possibly structured as a loan. The granary located at the well-secured city of Puṇḍranagara was ordered, likely by the metropolitan Magadhan authority, to dispatch aid to the neighbouring region of Vaṅga, which was experiencing an emergency. This detail indicates that the aid was not immediate relief following the flood, which explains why unhusked paddy, rather than rice or other food items, was provided. The record, therefore, reflects a measure focused on recovery and rebuilding, particularly through agricultural support.

The Sohgaura record represents a pre-calamity administrative measure, contrasting with the Mahasthan inscription, which documents post-calamity relief management. Although these emergencies were unrelated, both inscriptions focus on community or locality-specific crises. The Sohgaura inscription outlines an administrative directive indicating the preparedness of the political authority to address potential disasters in the area. The directive, in the form of a notice, was meant to be affixed to the granary doors, highlighting that the granaries were established for storing grains and other essential items to be utilized exclusively in emergencies (Jayaswal, 1938, pp. 1-3). Alongside the Brahmi script, the epigraph also features symbolic representations, including depictions of two granaries, consistent with the text's reference to two granaries. Written in Magadhi Prakrit, the inscription signifies a royal command from the central administrative hub of Magadha to the regional centre at Manavasi, or Sohgaura. The record mentions two granaries at Manavasi junction, which were three-tiered (*tighavani* or *trigarbhāni*), specifically designated for storing provisions in anticipation of emergencies. The inscription states that the goods stored in these granaries were intended solely for communal use during emergencies, as indicated by the term "*vala kayiyati atiyāyikaya*", meaning for use during crises. The restriction on their use in normal circumstances is emphasized by the phrase "*no gahitavaya*", meaning not to be taken (Basu Majumder, 2023, p. 52). The notification applied to particular merchants or traders, notably those travelling from Mathura, Cañcu, and Medama to Manavasi. R. Ghosh theorizes that three copies of this record were created: two for display at the respective granary locations in Dasilimata and Usagrama, and a third retained by the administrative office (Ghosh, 2007, pp. 110-113). The Sohgaura record exemplifies the proactive measures of the central Magadhan administration to prepare for an impending famine around Sohgaura. The calamity, likely originating in *Cañcu*, was so severe that it came to be named after the region. This record underscores the systematic arrangements and preparedness of the Mauryan metropolitan authority to mitigate potential disaster impacts.

If the Sohgaura and Mahasthan inscriptions are examined together in the context of disaster or calamity management during the early historic period, particularly under the Mauryan

administration, these records provide significant insights. They demonstrate the necessity of a state-controlled economic system and a comprehensive administrative apparatus to implement such organized disaster management practices, both of which are evident in these inscriptions. The Mauryan state adopted a proactive and positive approach to alleviating the suffering of famine-stricken regions. These records highlight public policies aimed at disaster mitigation and famine relief, which involved the disbursement of grains and monetary aid through regional and local administrative centres. Taken together, the Mahasthan and Sohgaura inscriptions offer valuable insights into the relief efforts undertaken by the state apparatus and the attitude of the Mauryan state toward addressing such crises. The efficiency and foresight of the Mauryan state in managing relief measures reflect not just philanthropy but a strategic vision for governance. This approach ensured that such calamities did not significantly disrupt the state's revenue collection or overall administrative stability. The prominent role of the state in famine relief operations underscores its importance as a central point within a network of local settlements, suggesting a systematic and interconnected administrative framework (Chattopadhyaya, 2003).

The text *Meṇḍakāvadāna* describes three categories of famines: *Cañcu, Svetasthi,* and *Salakavrtti.* It is mentioned that during the *Cañcu* famine, people were forced to survive on grains that had been collected in a box for performing rites to appease the deceased. During the *Svetasthi* famine, individuals boiled bones gathered from various places until they turned completely white and consumed the resulting soup. The *Salakavrtti* famine, considered the most severe among the three, saw people extracting grains and molasses stuck in crevices or drainage holes using sticks. These were then boiled with large amounts of water, and the resulting liquid served as food for the famine-affected population (Basu Majumder, 2023, p.75). As noted in the Sohgaura bronze plaque inscription, *Cañcu* is identified as a location from where grains and other essential goods were to be transported and stored in two designated storehouses. This suggests that the famine had not yet impacted *Cañcu*, and it is likely that the prediction of an impending famine had prompted the government to make arrangements to mitigate its effects in advance.

Conclusion

In the early stages of human civilization, the environment significantly influenced the lives and activities of people. To conclude, ancient India developed a philosophy of disaster management deeply rooted in traditional injunctions as found in various scriptures. The early Indian perspective towards nature was a blend of spiritual and philosophical ideologies intertwined with social consciousness and environmental principles. The notion of disaster management is not a modern concept but has persisted throughout history. Accounts of climatic changes, famines, falling celestial bodies, widespread haze, gas emissions, and tidal waves cannot simply be dismissed as fabrications of the ancient priestly class to control uninformed masses. Ancient Indian texts delve deeply into the subject of disasters in multiple ways, demonstrating that such events had a profound effect on societies of the time. The unpredictability of these calamities caused social anxiety within ancient Indian communities. Consequently, both normative and creative literature, along with epigraphical sources, outlined numerous strategies and principles for managing disasters to mitigate their impact. This highlights the level of understanding and preparedness for disaster management in ancient India, reflecting an advanced awareness of such challenges in their historical context. Disasters were not singular occurrences, and their recurring nature is evident in historical records created over various periods. The humanitarian approaches to disaster management

played a vital role in helping affected populations regain normalcy. Over time, these practices gave rise to concepts of sustainable development in ancient Indian society, aimed at preventing similar future calamities. This realization underscored the significance of disaster management in mitigating the unpredictable nature of such events. As a result, in addition to detailing disasters, these texts elaborate on various aspects of disaster management strategies. Moreover, these writings outline the responsibilities of kings or governing bodies during times of crisis or natural disasters. References to royal officials in historical documents indicate that the relationship between the ruler or state and the people extended beyond mere revenue collection. In times of disaster, the welfare-oriented policies of the state facilitated the restoration of societal order. This highlights how disaster management practices were integral to the political, economic, and cultural fabric of ancient Indian society. Consequently, the awareness of disasters, coupled with the knowledge of disaster management and sustainable development, undeniably contributed to shaping interactions and developments within ancient Indian society.

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