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Famines and Epidemics in Medieval India: Climatic Change or a Policy Failure?

Abstract

Several studies are available to study famines and epidemics in India, but there is a research gap on the co-occurrence of these natural catastrophes in the medieval era and the role of human factors behind them. This article is an attempt to postulate the factors responsible behind the increased appearance of famines and epidemics, their consequences and interdependence. Climate change was observed in the medieval India that was the result of human actions and depicts that policy failure was the factor behind increased instances of famines and epidemics.

Key words: Famines, Epidemics, Climate, Urbanization, and Migration.

Introduction:

Environmental degradation in the form of urbanization, deforestation, water wastage, and poor sanitation continued during the medieval era which made it more vulnerable to famines and epidemics. India was an agricultural country, any political or climatic factor that affected crop production became the primary reason for these natural catastrophes. The climatic change was a dominant factor in the recurrence of famines and epidemics during the medieval era. A climate variation was witnessed worldwide and had impacted India.

Early Medieval India:

The frequency of famines and epidemics increased during the medieval era in India. Acute famines emerged in India in the tenth century.[1] The first one took place in 917-918 AD[2] in the region of Kashmir, and the second drastic famine occurred under the Delhi Sultan, Muhammad bin Tughlaq (1290-1351).[3] As described by the thirteenth century Indo-Persian historian, Ziauddin Barani (1285-1357), the primary reasons behind the emergence of famine was the imposition of immense land taxes and the exploitation of the peasants at the hands of the aristocrats.[4] Unpredictable climate fluctuations, such as floods, monsoon failure, and wars, resulted in acute famines during the Chola period (850-1279 AD).[5]

Climatic Variations:

Climate had a significant role in medieval India. Less rainfall in the Himalayas resulted in famines, wars, rebellions which led to a population decrease.[6] As the snow melted slowly, it affected irrigation by decreasing the water in the river Indus.[7] From 1200-1300 AD

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[1] R. Ganguli, "Famine in Ancient India," *Annals of the Bhandarkar Oriental Research Institute*, Vol. 15, No. ¾ (1933-34): 176, accessed February 5, 2021, https://www.jstor.org/stable/41694849.
[2] Ibid., 176.
[3] Ziauddin Barani, *Tareekh-e-Firuz Shahi*, trans. Syed Moin ul Haq (Lahore: Urdu Science Board, 1969), 671.
[4] Ibid., 672-673.
[5] A. Mohan Ram, "Famines And Relief Measures Under the Imperial Cholas (850-1279 A.D.)," *Proceedings of the Indian History Congress*, Vol. 45 (1984): 182, accessed September 18, 2021, https://www.jstor.org/stable/44140197?seq=2#metadata_info_tab_contents.
[6] M. H. Panhwar, *Chronological Dictionary of Sindh*, (1983), accessed August 8, 2021, http://panhwar.net/SIX%20THOUSAND%20YEARS%20OF%20HISTORY%20OF%20IRRIGATION%20IN%20SINDH.pdf.
[7] Ibid.

and in 1350 AD, climate changed, giving way to famines.[8] In the late twelfth century, dry climate spelled central Asia.[9] During this time, the Sultan of the Ghurid Empire, Muhammad of Ghor (r.1173-1206) conquered India, and established his government in 1186 A.D.[10] The change in Muslim dynasties in Iran, Afghanistan, Morocco, and beyond depicts the impact of climatic change.[11] With the spell of drought over Sindh from 1200 AD Ghori's lost Afghanistan and Central Asia's control.[12] It shows that droughts,famines, and epidemics had a profound role in the downfall of dynasties in India.

The Delhi Sultan, Firuz Shah Tughlaq (r.1351-1388) had to face the dreadful consequences of drought as the aridity increased throughout his reign, resulting in rebellions throughout his reign.[13] From 1340-1400 AD, there was less rainfall that resulted in rebellions and consequently led to the empire's downfall.[14] Many small kingdoms emerged in 1400 AD in the Delhi sultanate.[15] As trade, education, and crop production increased, urban centers emerged in medieval India.[16] These steps gave rise to extended rural settlements, as people settled in the newly settled areas. These urban centers, later on, became the focus of diseases.

The Delhi Sultanate:

The Delhi Sultanate was not immune to famines and epidemics. These natural catastrophes were the result of human factors. A drought took place in Delhi during Sultan Iltutmish's rule (r.1211-1236), and many people lost their lives due to hunger.[17]

Famine occurred under the Delhi Sultan, Jalal-ud-din Khilji (r. 1290-1296).[18] Under Jalal-ud-din Khilji, a darwesh Sidi Maula was killed as he was accused of plotting Sultan Jalal-ud-din's murder along with a qazi, Jalal Kashani.[19] Ziauddin Barani wrote that the day he was killed, a thunderstorm hit the country, and marked the decline of Jalal-ud-din's rule.[20] In the same year a famine appeared in Delhi and many people along with their kids drowned themselves in the River Yamuna.[21]

Sultan Alauddin Khilji (r. 1296-1316) introduced a price control policy, and the price of certain commodities was fixed in Delhi.[22] The Sultan faced Mongol invasions and large-scale conquests that no other Sultan of Delhi had faced.[23] During the days of famine, people were not allowed to buy grains more than they needed.[24] People drowned themselves to avoid

[8] Ibid.
[9] Ibid.
[10] Ibid.
[11] Ibid.
[12] M. H. Panhwar, *Chronological Dictionary of Sindh*, (1983), accessed August 8, 2021, http://panhwar.net/SIX%20THOUSAND%20YEARS%20OF%20HISTORY%20OF%20IRRIGATION%20IN%20SINDH.pdf.
[13] Ibid.
[14] Ibid.
[15] Ibid.
[16] Renu Thakur, "Mechanisms of urban growth in India: AD 600–1200," *Urban History*, Vol. 29, No. 2 (August 2002): 189, accessed July 2, 2021, https://www.jstor.org/stable/44613320?seq=1#metadata_info_tab_contents.
[17] A Rashid, "Famine in the Turco-Afghan Period," *Proceedings of the Indian History Congress*, Vol. 26, PART II (1964): 85, accessed September 1,2021, https://www.jstor.org/stable/44140326?seq=5#metadata_info_tab_contents.
[18] Ibid., 86.
[19] Ziauddin Barani, *Tareekh-e-Firuz Shahi*, trans. Syed Moin ul Haq (Lahore: Urdu Science Board, 1969), 321.
[20] Ibid., 324.
[21] Ibid., 324.

[22] Humera Naz, "Price Control Policy of Alauddin Khalji: Achievement or Failure," *Jhss*, Vol. 1 (2010): 69, accessed August 4, 2021, https://msbrijuniversity.ac.in/assets/uploads/newsupdate/5-Price%20Control%20Policy%20of%20Alauddin%20Khalji.pdf.
[23] Ibid., 82.
[24] A Rashid, "Famine in the Turco-Afghan Period," *Proceedings of the Indian History Congress*, Vol. 26, PART II (1964): 86, accessed September 1, 2021, https://www.jstor.org/stable/44140326?seq=5#metadata_info_tab_contents.

famine.[25] It shows that famine in the Khilji dynasty was the outcome of policy failure of the rulers.

Famine Under Tughlaq Dynasty:

Sultan Firuz Shah Tughlaq's (1320-1412) reign was also marked with famines, as he took away all the crops during the harvest season from Thatta to Gujarat, resulting in a famine in Thatta.[26] The people of Thatta had an abundance of produce, but this attack brought a scarcity of food.[27] Commodities and goods became expensive in the areas where famine occurred, so people had to migrate to other famine-free areas.[28] Migration of people must have spread epidemics from one place to another. Under Sultan Muhammad bin Tughlaq (r.1325-1351) the assessment of land in the region of Doab was increased, and secondly, he introduced brass coins to replace silver coins.[29] As a result, the price of grain increased and followed by the rain failure, a famine appeared which continued for years.[30] The increase in the assessment forced the people to burn their crops, and they indulged in robbery (1332-1333).[31] Muhammad even ruined the crops and assassinated people of Baran (Bulandshahr), Dalmau and Kanauj.[32] He levied new taxes on the people and collected land tax based on standard production and not the actual product.[33]

According to Barani, an epidemic (waba) also appeared in Sultan Tughlaq's army in 1321 AD.[34] Sultan Muhammad bin Tughlaq reached Delhi in 1337, and on his way, he saw Malwa in shattered condition due to a famine.[35] People indulged in cannibalism as they ate their children.[36] Animal's skin was sold as food during these years of famine.[37] Moreover, Sultan Muhammad bin Tughlaq levied heavy land taxes and transferred his capital to Daulatabad, resulting in a famine at Delhi in 1337.[38] All these measures had an adverse economic impact that also added to the horrors of the famine.

Disintegration of the Delhi Sultanate:

One of the rare consequences of drought and cold in the post-1350 AD led to the disintegration of the Delhi sultanate into small independent states.[39] The son of Emperor

[25] Atreyi Biswas, *Famines in Ancient India: A study of Agro-economy from Prehistoric to Early Historic Period*, (New Delhi: Gyan Publishing House, 2013), 14-15.
[26] A Rashid, "Famine in the Turco-Afghan Period," *Proceedings of the Indian History Congress*, Vol. 26, PART II (1964): 85, accessed September 1,2021, https://www.jstor.org/stable/44140326?seq=5#metadata_info_tab_contents.
[27] Ibid., 85.
[28] Ibid., 87.
[29] Ziauddin Barani, *Tareekh-e-Firuz Shahi*, trans. Syed Moin ul Haq (Lahore: Urdu Science Board, 1969), 671-675.
[30] Ibid., 672.

[31] Wolseley Haig, "Five Questions in the History of the Tughluq Dynasty Of Dihli," *The Journal of the Royal Asiatic Society of Great Britain and Ireland*, No. 3 (July, 1922): 342, accessed August 1, 2021, https://www.jstor.org/stable/pdf/25209907.pdf?refreqid=excelsior%3A7aef7cebdf341e718c6631442f828614.
[32] Ziauddin Barani, *Tareekh-e-Firuz Shahi*, trans. Syed Moin ul Haq (Lahore: Urdu Science Board, 1969), 683.
[33] Ibid., 672.
[34] Ziauddin Barani, *Tareekh-e-Firuz Shahi*, trans. Syed Moin ul Haq (Lahore: Urdu Science Board, 1969), 685-686.
[35] Ibid., 687.
[36] Wolseley Haig, "Five Questions in the History of the Tughluq Dynasty Of Dihli," *The Journal of the Royal Asiatic Society of Great Britain and Ireland*, No. 3 (July, 1922): 347, accessed August 1, https://www.jstor.org/stable/pdf/25209907.pdf?refreqid=excelsior%3A7aef7cebdf341e718c6631442f828614.
[37] Ibid., 347.
[38] Ziauddin Barani, *Tareekh-e-Firuz Shahi*, trans. Syed Moin ul Haq (Lahore: Urdu Science Board, 1969), 673.
[39] M. H. Panhwar, *Chronological Dictionary of Sindh*, (1983), accessed August 8, 2021, http://panhwar.net/SIX%20THOUSAND%20YEARS%20OF%20HISTORY%20OF%20IRRIGATION%20IN%20SINDH.pdf.

Timur, Pir Muhammad Jahangir inflicted such conditions on Multan that its ruler, Sarang, his people, and the army had to surrender.[40] There was such a shortage of food that even the city's animals died as the famine prevailed.[41] During the reign of the Pashtun Sultan of Delhi Sultanate, Sikandar Lodi (1458-1517), a famine occurred in some areas of Northern India.[42]

The Black Death:

The Bubonic plague (the Black Death) occurred in India in the early seventeenth century under Emperor Jahangir in 1616.[43] The plague reached India under Jahangir due to his military expansion towards the Himalayas or by European or Arab traders.[44] Thus, geography of India made it vulnerable to famines leading to epidemics, in contrast, it also protected India from several diseases.

Relief Measures Adopted by the Sultans:

The Sultans took specific steps to provide relief to the famine-stricken people. Sultan Jalaluddin Khilji distributed gifts to the people during famine days.[45] Similarly, during the rule of Sultan Alauddin Khilji , people only bought corn according to their needs from the market.[46]

Sultan Muhammad bin Tughlaq also distributed gifts and provisions among the people of Delhi.[47] Furthermore, he abolished import duties and took other measures. Sikandar Lodi also took measures to provide relief to the famine-stricken people.[48] He abolished *Zakat* for a brief period and distributed gifts among the people but this was a temporary measure.[49]

Famines and Epidemics in Mughal India:

Baburnama mentions instances of malaria.[50] The plague ravaged Sindh in 1548 and took the lives of many people.[51] Famine and plague epidemic occurred in Gujarat in 1574-75 due to changes in climate and oppression.[52] Insufficient rainfall resulted in famine followed by a plague epidemic in 1595-1598.[53] Epidemics followed the famines of 1345, 1299, 1574, and 1594, and forced the people to turn into cannibals.[54]

From 1616-1624, the plague appeared during the winter months and disappeared during the summer season.[55] The plague in 1616 was so harsh that a thousand people died in a single day.[56] As recorded in *Tuzuk-i-Jahangiri,* in 1616, the first acute plague epidemic

[40] H. M . Elliot, *TUZAK-I-TIMURI: The Autobiography of Timur*, (Lahore: Sang-e-Meel Publications, 2004), 34.

[41] Ibid., 34.
[42] A Rashid, "Famine in the Turco-Afghan Period," *Proceedings of the Indian History Congress*, Vol. 26, PART II (1964): 84, accessed September 1, 2021, https://www.jstor.org/stable/44140326?seq=5#metadata_info_tab_contents.
[43] Jahangir, *Waki'at-I Jahangiri*, trans. Sheikh Mubarak Ali (Lahore: Sheikh Mubarak Ali Publishers and Booksellers, 1975), 71.
[44] Ibid., 341
[45] A Rashid, "Famine in the Turco-Afghan Period," *Proceedings of the Indian History Congress*, Vol. 26, PART II (1964): 86, accessed September 1, 2021, https://www.jstor.org/stable/44140326?seq=5#metadata_info_tab_contents.
[46] Ibid., 86.
[47] Ziauddin Barani, *Tareekh-e-Firuz Shahi*, trans. Syed Moin ul Haq (Lahore: Urdu Science Board, 1969), 707.
[48] A Rashid, "Famine in the Turco-Afghan Period," *Proceedings of the Indian History Congress*, Vol. 26, PART II (1964): 87, accessed September 1, 2021, https://www.jstor.org/stable/44140326?seq=5#metadata_info_tab_contents.
[49] Ibid., 87.
[50] Ibid., 311.
[51] Ibid., 311.
[52] Enayatullah Khan, "Visitations of Plague in Mughal India," *Proceedings of the Indian History Congress*, Vol. 74 (2013): 306, accessed September 7, 2021, https://www.jstor.org/stable/44158829?seq=1#metadata_info_tab_contents. .
[53] Ibid., 307.
[54] Atreyi Biswas, *Famines in Ancient India: A study of Agro-economy from Prehistoric to Early Historic Period*, (New Delhi: Gyan Publishing House, 2013), 15.
[55] Enayatullah Khan, "Visitations of Plague in Mughal India," *Proceedings of the Indian History Congress*, Vol. 74 (2013): 307, accessed September 7, 2021, https://www.jstor.org/stable/44158829?seq=1#metadata_info_tab_contents.
[56] Ibid., 307.

occurred in Punjab.[57] The physicians believed that two years of drought and the changes in the air gave way to these epidemics.[58] Drought and plague co-existed during the year 1682 at Dakhin.[59]

Health is linked to clean water, food, and proper sanitation.[60] Hence, during the days of famine, access to clean water or food became difficult.[61] Similarly, sanitary conditions were limited to urban centers which worsened the situation.[62] In 1556 most of the cities of northern India were ravaged by plague under the commander-in-chief of the Mughal army, Bairam Khan.[63] The plague reemerged in 1574-75 and wiped away the population of many towns.[64] The recurrence of the plagues tells that the social conditions of the masses of India were poor.[65] The 1630 famine, followed by plague in 1632 ravaged Surat, Mewar, and neighboring areas forcing people to migrate.[66] Migration was a significant outcome of famines, and it resulted in epidemics as the overcrowdedness increased the chances of spreading various diseases.

Smallpox like cholera was not a new disease in India, but as compared to the ancient times, its intensity increased during the medieval era. Goddess Shitala also appeared in the 16th century in medieval literature.[67] Smallpox became more frequent in India in the 17th century, and one of the prime reasons behind this was changes in the ecological balance and climate.[68] In medieval India, Emperor Jahangir recorded cholera in his memoirs for the first time.[69] The vizier of Emperor Akbar, Abul Fazl in 1575 recorded malaria that emerged as an epidemic and took away the lives of nobles and common masses due to fever.[70] Malaria in 1616 also affected the health of Jahangir and, in 1618, took the lives of many people, including the Europeans.[71]

Indian Medicinal system:

Unani medicine that included different medical works including the Indian was brought into India by physicians and scholars.[72] Under Khaljis an amalgamation of Ayurveda

[57] Jahangir, *Waki'at-I Jahangiri*, trans. Sheikh Mubarak Ali (Lahore: Sheikh Mubarak Ali Publishers and Booksellers, 1975), 71.
[58] Ibid.
[59] Enayatullah Khan, "Visitations of Plague in Mughal India," *Proceedings of the Indian History Congress*, Vol. 74 (2013): 310, accessed September 7, 2021, https://www.jstor.org/stable/44158829?seq=1#metadata_info_tab_contents.
[60] Ibid., 306.
[61] Ibid., 306.
[62] Anjali Sharma, Manoj Kumar, M. P. Singh, and H. K. Mazhari, "Medieval (Islamic) Cities in India (1206–1764): An Environmental Review and its Contemporary Relevance," *Indian Historical Review*, Vol. 46(1) (2019): 65-73, accessed January 8, 2022, https://journals.sagepub.com/doi/pdf/10.1177/0376983619856166.
[63] Enayatullah Khan and M. Parvez, "Health and Disease in Medieval India," *Vidyasagar University Journal of History*, Volume III (2014-2015): 6, accessed September 9, 2021, http://inet.vidyasagar.ac.in:8080/jspui/bitstream/123456789/1842/1/5%20Health%20and%20Disease.pdf.
[64] Ibid., 4.
[65] Ibid., 6.
[66] Anjali Sharma, Manoj Kumar, M. P. Singh, and H. K. Mazhari, "Medieval (Islamic) Cities in India (1206–1764): An Environmental Review and its Contemporary Relevance," *Indian Historical Review*, Vol. 46(1) (2019): 65-73, accessed January 8, 2022, https://journals.sagepub.com/doi/pdf/10.1177/0376983619856166.
[67] Enayatullah Khan and M. Parvez, "Health and Disease in Medieval India," *Vidyasagar University Journal of History*, Volume III (2014-2015): 6, accessed September 9, 2021, http://inet.vidyasagar.ac.in:8080/jspui/bitstream/123456789/1842/1/5%20Health%20and%20Disease.pdf.
[68] Ibid., 14.
[69] Ibid., 17.
[70] Abul Fazl, Ain-I Akbari, tr. H. Blochmann, vol. I, (Delhi: Low Price Publications, 1989), 334-335.
[71] Jahangir, *Waki'at-I Jahangiri*, trans. Sheikh Mubarak Ali (Lahore: Sheikh Mubarak Ali Publishers and Booksellers, 1975).
[72] Ibid., 531.

and Unani medicine occurred.[73] The Mughal and post-Mughal empires used medical knowledge to legitimize their authority.[74]

Solar Minima during the Mughal era:

Changes in the climate during the Mughal era also had a profound impact and resulted in famines followed by epidemics. From 1450-1750 the world witnessed a declined solar activity.[75] There were almost no sunspots from 1460-1550 and 1645-1715.[76] These sunspots affect solar activity as more sunspots indicate higher solar activity, and few sunspots depict low solar activity termed Solar minima and it reduced monsoonal rainfall.[77]

India was an agrarian country that depended on rainwater; hence, any variation in the monsoon rainfall had a deeply negative impact.[78] The Mughal period coincided with the Spörer Minimum, particularly during Akbar, Jahangir, Shah Jahan, and Aurangzeb.[79]

Famines under Mughal Rulers:

Shah Jahan (1628-1658) started the construction of the Taj Mahal which almost cost 41.8 million rupees.[80] Hence, he spent 4.18 crore silver rupees on the Taj Mahal at the cost of 7.4 million people.[81] Thus, it was the negligence of Shah Jahan that resulted in famine. Due to famine in Bihar, prices of essential goods increased, which affected the poverty-stricken people.[82] Food was so scarce that a woman even ate her child.[83] Massive migration of people from Patna to Decca was another consequence of famine.[84] The migration must have resulted in transmission of diseases. During the rule of Sher Shah (1540-1545), Deccan was devastated by famine.[85] He also issued Farman about helping the poor during poor crop production days.[86]

Bengal also received excessive rain in 1644-1655 and 1648 that destroyed sugarcane crops.[87] The whole of India received less rainfall in 1650, but the region from Agra to Ahmedabad suffered the most from crop failure.[88] From 1659-1660 famine and plague reduced the population of Sindh by killing most of the people.[89] Again in 1697, famine

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[73] Ibid., 532.

[74] Seema Alavi, "Medical Culture in Transition: Mughal Gentleman Physician and the Native Doctor in Early Colonial India," *Modern Asian Studies*, Vol. 42, No. 5 (September 2008): 856, accessed September 2, 2021, https://www.jstor.org/stable/20488046?seq=1#metadata_info_tab_contents.

[75] C. Uberoi, "Little Ice Age in Mughal India: Solar Minima Linked to Droughts?" *EOS*, Vol.93 (October 2012): 437, accessed August 2, 2021, https://agupubs.onlinelibrary.wiley.com/doi/pdf/10.1029/2012EO440001.

[76] Ibid., 437.

[77] "Modern Grand Solar Minimum," Journals of India, (January 2021), accessed January 3, 2022, https://journalsofindia.com/modern-grand-solar-minimum/.

[78] C. Uberoi, "Little Ice Age in Mughal India: Solar Minima Linked to Droughts?" *EOS*, Vol.93 (October 2012): 437, accessed August 2, 2021, https://agupubs.onlinelibrary.wiley.com/doi/pdf/10.1029/2012EO440001.

[79] Ibid., 437.

[80] Ibid.

[81] Ibid.

[82] R. N. Prasad, "Bihar Famine of 1670-71," *Proceedings of the Indian History Congress* Vol. 39, Volume I (1978): 531, accessed September 2, 2021, https://www.jstor.org/stable/44139391?seq=4#metadata_info_tab_contents.

[83] Ibid., 531.

[84] Bhishwanath Gosh, "When fear of epidemic drove Agra prisoners from jail to the Taj Mahal," *The Hindu*, last modified September 2020, accessed July 12, 2021, https://www.thehindu.com/news/national/other-states/when-fear-of-epidemic-drove-agra-prisoners-from-jail-to-the-taj-mahal/article32588060.ece?__cf_chl_captcha_tk__=pmd_L79M0fkpj5Y5Q_kOrsqQiGGgWrls6yZcySMmUxT.rS0-1631889978-0-gqNtZGzNAzujcnBszQc9.

[85] Muhammad Parvez and Enayatullah Khan, "Famines in Mughal India," *Vidyasagar University Journal of History*, Vol. 5 (2016-2017): 30, accessed September 19, 2021, http://inet.vidyasagar.ac.in:8080/jspui/bitstream/123456789/4496/1/Muhammad%20Parwez.pdf.

[86] Ibid., 30.

[87] Muhammad Parvez and Enayatullah Khan, "Famines in Mughal India," *Vidyasagar University Journal of History*, Vol. 5 (2016-2017): 26, accessed September 19, 2021, http://inet.vidyasagar.ac.in:8080/jspui/bitstream/123456789/4496/1/Muhammad%20Parwez.pdf.

[88] Ibid., 26.

[89] M. H. Panhwar, *Chronological Dictionary of Sindh*, (1983), accessed August 8, 2021, http://panhwar.net/SIX%20THOUSAND%20YEARS%20OF%20HISTORY%20OF%20IRRIGATION%20IN%20SINDH.pdf.

devastated many *Parganas* and Marwar.[90] This famine followed by plague, reached Sindh and took the lives of almost 80,000 people.[91] The Mughals did not pay much attention to the artificial irrigation methods and constructed insufficient water reservoirs.[92]

The famine of 1770 was one of the worst calamities in Bengal's history as it took the lives of almost 10 million people.[93] The East India Company continued to receive revenue, and did not lower it even during the crucial days.[94] People even ate dead bodies to survive this acute famine.[95] The famine was also accompanied by plague that worsened the conditions, and hundreds of people died daily on streets and roads.[96]

Relief Measures Adopted by the Mughal Rulers:

The Mughal rulers and the Afghan rulers only took short-term measures.[97] Under the Mughal Emperor Akbar in 1597, a famine struck, and food was distributed among the poor every Sunday.[98] However, the extent of food distribution and whether it reached rural areas or not is unknown.[99] Furthermore, the Mughal rulers Shah Jahan and Aurangzeb distributed grants during the famines.[100] However, these grants never reached all the people as the corrupt state officials utilized these for their benefits.[101]

Sanitation and Ecological Degradation during the Medieval era:

Urbanization multiplied under the Sultans and also grew manifolds under the Mughals.[102] They built wells, canals, tanks, to irrigate lands and also to provide water to urban areas.[103] Similarly, Mughal capitals had amazing waterworks such as Kol Lake at Fatehpur Sikri and Anguri Bagh at Agra.[104] The Sultans and Mughals built *hammams* near mosques for ablution and also at other areas.[105] There was a demarcation between rich and poor so the grand mosques and residential areas with *hammams* were for the nobles and not the general population.[106] Sanitation only improved in the urban areas for the rich people and not for the poor.

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[90] Ibid..
[91] Muhammad Parvez and Enayatullah Khan, "Famines in Mughal India," *Vidyasagar University Journal of History*, Vol. 5 (2016-2017): 29, accessed September 19, 2021, http://inet.vidyasagar.ac.in:8080/jspui/bitstream/123456789/4496/1/Muhammad%20Parwez.pdf.
[92] Ibid., 22.
[93] John R. McLane, *Land and local kingship in eighteenth-century Bengal* (Cambridge University Press, 2009): 194, accessed July 10, 2021, https://booksc.org/book/71452751/8fa9d7.
[94] Ibid., 194.
[95] John R. McLane, *Land and local kingship in eighteenth-century Bengal* (Cambridge University Press, 2009), 195, accessed July 10, 2021, https://booksc.org/book/71452751/8fa9d7.
[96] Ibid., 196.
[97] Mushtaq A.Kew, "Famines in Kashmir, 1586-1819: The policy of the Mughal and Afghan rulers,," *The Indian and Social History Review*, (1996): 63, accessed September 3, 2021, https://journals.sagepub.com/doi/abs/10.1177/001946469603300103?journalCode=iera.
[98] Ibid., 63.
[99] Mushtaq A.Kew, "Famines in Kashmir, 1586-1819: The policy of the Mughal and Afghan rulers,," *The Indian and Social History Review*, (1996): 63, accessed September 3, 2021, https://journals.sagepub.com/doi/abs/10.1177/001946469603300103?journalCode=iera.
[100] Ibid., 64.
[101] Ibid., 64.
[102] Anjali Sharma, Manoj Kumar, M. P. Singh, and H. K. Mazhari, "Medieval (Islamic) Cities in India (1206–1764): An Environmental Review and its Contemporary Relevance," *Indian Historical Review*, Vol. 46(1) (2019): 56, accessed January 8, 2022, https://journals.sagepub.com/doi/pdf/10.1177/0376983619856166.
[103] Georgios P. Antoniou, Giovanni De Feo, Franz Fardin, Aldo Tamburrin, Saifullah Khan, Fang Tie, Ieva Reklaityte, Eleni Kanetaki, Xiao Yun Zheng, Larry W. Mays, and Andreas N. Angelakis, "Evolution of Toilets Worldwide through the Millennia," *Sustainability*, (2016), accessed January 18, 2022, https://www.academia.edu/67526320/Evolution_of_Toilets_Worldwide_Through_the_Millennia.
[104] Anjali Sharma, Manoj Kumar, M. P. Singh, and H. K. Mazhari, "Medieval (Islamic) Cities in India (1206–1764): An Environmental Review and its Contemporary Relevance," *Indian Historical Review*, Vol. 46(1) (2019): 62, accessed January 8, 2022, https://journals.sagepub.com/doi/pdf/10.1177/0376983619856166.
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Flush toilets were also visible during the mughal era.[107] Daulatabad was the first identified Islamic city with an extensive drainage system.[108] Similarly, Agra, Fatehpur Sikri, and Shahjahanabad had efficient drainage and sewage systems.[109] The water use in the urban areas also resulted in contaminated water, and garbage flow near the houses as sewerage was prominent in few cities, and inefficient drainage and sewage must have deteriorated the condition of the people.[110]

From the 12-18th century massive deforestation was observed which also was for trade, urbanization, cultivation, and military movement.[111] Deforestation may have caused disruption of the hydrological cycle, increased frequencies of disasters such floods and droughts due to climate change.[112] The lake at Fatehpur Sikri, dried up due to ecological degradation, and people abandoned it in 1585.[113]

Conclusion:

The medieval rulers focused on short-term relief measures that only helped people during the time of natural calamities but did not stop the famines and epidemics. The medieval era in India witnessed several conquests and thus the focus of rulers were the political affairs of the state thus, they did not pay much attention to artificial irrigation. Urbanization increased during the medieval era due to which epidemics also increased, but the Indian medicinal system saved people from horrors of death. The Muslim rulers tried to replace Ayurvedic system with Unani system of medicine, but could not as they have found that a complete change in system was not beneficial for the Indian people.

During the Mughal rule, the whole world witnessed a climatic change that also affected crop production in India, but the rulers provided immediate relief that saved India from high mortality. In the late Mughal era, famines and epidemics emerged that caused high mortality due to the ignorance of the rulers. Thus, the causes shifted from natural to artificial as the ignorance of the rulers towards agricultural reforms increased famines, the population increased but the means of sustenance remained the same as in ancient India. Similarly, increase in taxation and other revenue policies of the rulers had a negative impact and it increased the suffering of the people during famines.

Artificial irrigation formed the backbone of agriculture and until it was adopted in the colonial era, famines continued to ravage India. Famines and epidemics resulted in social vices as people indulged in hoarding, slavery, and robbery. Moreover, they also resulted in the disintegration of the Sultanate era and weakened the Mughal economy. Sanitation and hygiene were observed in the urban centers, but was limited to some classes which put people of poor classes residing in small houses, slums, and rural areas at a higher risk of epidemics.

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[107] Ibid., 68.
[108] Ibid., 68.
[109] Georgios P. Antoniou, Giovanni De Feo, Franz Fardin, Aldo Tamburrin, Saifullah Khan, Fang Tie, Ieva Reklaityte, Eleni Kanetaki, Xiao Yun Zheng, Larry W. Mays, and Andreas N. Angelakis, "Evolution of Toilets Worldwide through the Millennia," *Sustainability*, (2016), accessed January 18, 2022, https://www.academia.edu/67526320/Evolution_of_Toilets_Worldwide_Through_the_Millennia.
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[111] Mohammad Asrafur Rahman, **"**Colonial influences on our forests,**"** *The Daily Star*, (December 2007), accessed January 21, 2021, https://www.thedailystar.net/news-detail-15365.
[112] Ibid., 68.
[113] Ibid., 75.