

## Chapter IV

### **Rivers, Floods and Contagion: A Historical Survey on Rainfall, Embankments and Disease in Nineteenth and Twentieth Century North Bengal**

*“... Bengal is the gift of the Ganges (and of Brahmaputra). But along with gifts, not infrequently, come curses, and it was the sad lot of the people of North Bengal to have a taste of these...”*

----- Meghnad Saha, ‘The Great Flood in North Bengal’, *Modern Review* (vol. 32), November, 1922.

Bengal, as a whole, became wealthy in agricultural production and trade by the outstanding contributions of its rivers which nature has given to her. But the valuable offerings of rivers sometime got disturbed with the considerable increase in water level in the river-bed. The rivers of northern Bengal had their origin in the Himalayan hills which provided an undaunted supply of water throughout the year. But floods in this region caused both by the heavy or unseasonable rainfall in the plains and hills and unprecedented increase of water-level swept away the lands and people rested on its bank. Moreover, the intensity, duration and geographical distribution of rainfall throughout the region produced floods of varied in nature and severity. Duration of floods and their severity were determined by the quantity of inflow of waters caused by the cyclonic and general excess of local rainfall and outflow of waters depended on the subsequent evaporation, sloppy nature of the land or the drainage pattern (natural and constructed). Riverine morphology had a considerable impact towards the formation of topographical and agricultural settlement in

the northern districts of Bengal. Tista, the largest river of northern Bengal had many times brought about large quantity of water due to the melting of glacier or heavy rainfall in the hills which inundated a large tract of land spread across northern Bengal. Other rivers of northern Bengal like – Karatoya, Lish, Ghish, Torsa, Jaldhaka, Kaljani, Mahananda, Atrai etc. also flooded the region frequently. Ganges, rolling down to the southern part of northern Bengal mainly through the district of Murshidabad caused severe floods. Loosening of lands or rocks due to the heavy and sudden rains sometimes caused devastating landslides in the hilly part of northern Bengal which called for additional damage of human property and lives.

The entire North Bengal had been suffering from the devastating floods, especially during the monsoon months. The Himalayan origin of the rivers made them unpredictable and volatile in nature which could any time bring out large amount of water and mud in their streams caused by melting of snow or excessive rainfall. The loss of human and cattle lives and property had heightened the tension among the victims of the floods which frequently contributed to the impoverishment of the people. Destruction of crops and increase of food-prices called for famines when the human vulnerability had been overtly exposed to the mercy of State's charity or private philanthropy. Floods were not absolutely natural, but human interference with the nature helped to turn them in a more furious manner. Likewise, the intensity and duration of sufferings had been aggravated by the Governmental callousness and indifference. So, it is very much pertinent not only to detect the causes of the floods - whether natural or man-made, but also to examine the plight of the victims whose livelihood was affected by the floods but more critically endangered by the human agencies – whether State or market. The role of market in the post-flood scenario remained a crucial issue which should have to be dealt with utter seriousness and farsightedness. Moreover, embankment happened to be one of the most contentious issues during the colonial period and it was no less important for a region like northern Bengal which was intersected by numerous large and small rivers. River embankments, railway embankments contributed in a significant way to the occurrences of floods. The process of 'modernization' had brought with it signs of anxiety and agony for the Indians. Expansion of communication through roadways and railways had provided a fertile ground for the malarial germinations which were integrally connected with inundations. Embankments became a site of contestation between the colonizers and colonized, based on the issues of hierarchy and control. Rainfall which was

essential for the crop production, with its irregularity sometime had been blamed as to provide conditions for several diseases, like – malaria, cholera, diarrhea, small-pox etc. Widespread prevalence of disease, which sometime took epidemic shape, and increasing impoverishment was essentially connected with the colonial policy on embankments, irrigation and agriculture. Thus natural disaster like – floods call for a vivid analysis of the complex relationship between rainfall, rivers, crop production or failure, embankments, irrigation and diseases or epidemics.

This chapter is broadly divided into four parts. The first part deals with the famine of 1787 caused by the devastating flood which was instrumental to the change of course of the river Tista. The second part has described the causes and occurrences of floods took place in north Bengal from 1850s to the 1920s and the state of society, economy and market amidst the destructions of life and property. The third part of the article highlights the constructions and role of embankments, drainage and irrigation in connection with the occurrences of floods and examines the colonial ideology of construction and maintenance of these means to eradicate the severity of floods. Finally, the last part is related with the diseases and epidemics caused by waterlogging, embankments and contagion which had aggravated the sufferings and impoverishment for the people. Thus the chapter provides a detail analysis of floods and other collateral damages it brought about in form of destruction of lives, production and property in colonial north Bengal.



Map 4.1: Rivers of Bengal

Source: Sugata Bose, *The New Cambridge History of India III: 2; Peasant Labour and Colonial Capital: Rural Bengal since 1770*, Cambridge University Press, Cambridge, 1993, p. 10.

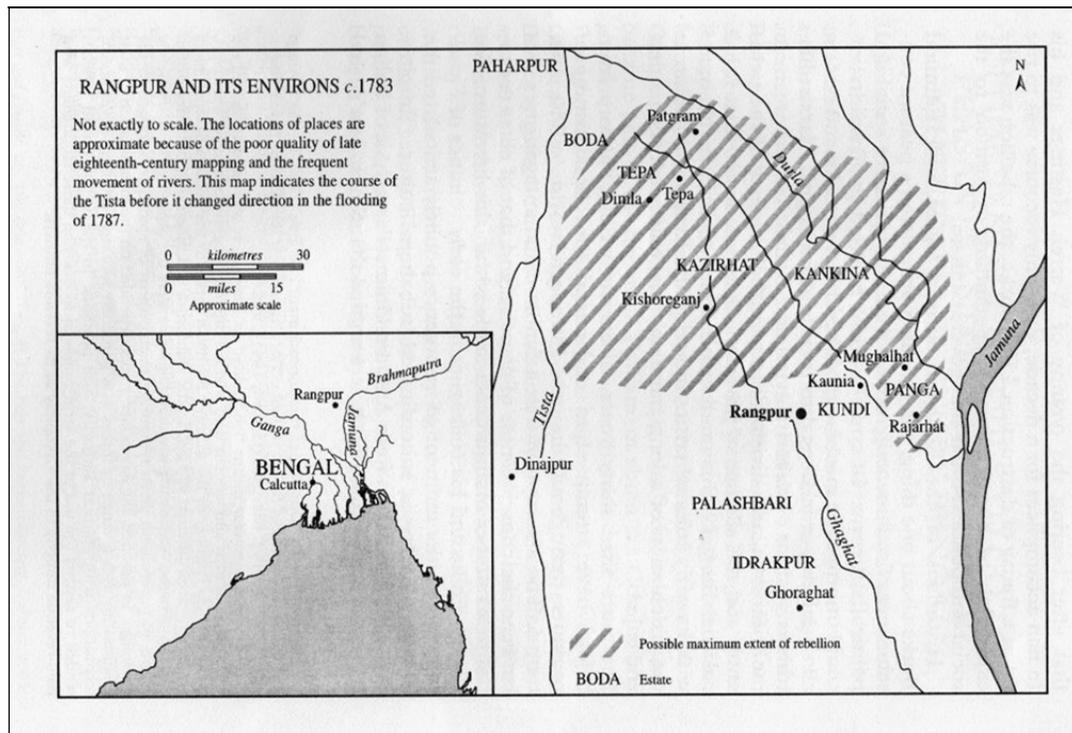
## I

### ***An Early History of Flood in North Bengal: Flood and Famine of 1787-88***

A devastating flood occurred in Tista in 1787 which changed the course of the river. The flood devastated the districts of Jalpaiguri and Rangpur. The flood of 1787 was triggered by couple of reasons. First, the beginning of the monsoon season in 1787 was too early, began from the month of March, in comparison with the average trend of the previous years and without having any suspension it continued till July. Second, there was a major cyclone in the early of November 1787. The cyclone devastated a large area of northern and eastern Bengal. This cyclone had also added to the growing intensity of the flood and these together had resulted in the considerable damage of cattle and crops. The worst was the case for Rangpur where the harvest failure and crop destruction, resulted from the flood, produced a famine situation; though the district of Jalpaiguri did not witness any situation like the former. Tista which is the largest river of the district of Jalpaiguri had entered into the district “from Darjeeling at its north-western corner, and flows in a south-easterly direction until it passes into Rangpur District from Patgram. The Tista forms “the boundary of the Duars, dividing from the permanently settled portion of the district, which, previous to 1869, belonged to Rangpur....The Tista itself falls into the Brahmaputra, a little above the town of Raniganj in Rangpur District.”<sup>1</sup> Before the disastrous flood of 1787 Tista used to flow from a different channel. According to Major Rennel, “The Teesta is a large river which runs almost parallel to the Ganges for nearly a hundred and fifty miles. During the dry season, the waters of Teesta run into those of the Ganges by two distinct channels, situated about twenty miles from each other, and a third channel at the same time discharges itself into the Megna; but during the season of the floods, the Ganges runs into the Teesta whose outlet is then confined to the channel that communicates with the Meghna.”<sup>2</sup>

The change of river-course had also funded to the change of the physical aspects of the old channels from which Tista ran through and the parts of the district as a whole. Dr. Buchanan-Hamilton in 1809 observed that: “the floods of 1787 seem totally to have changed the appearance of this part of the country, and to have covered it with beds of sand, so that few of the old

channels can be traced for any distance; and the rivers which remain seldom retain the same name for more than three or four miles in any one part of their course....”<sup>3</sup> During the flood of 1787 Tista suddenly deserted its earlier channel and turned its waters into a small branch which was an ancient bed of Tista.<sup>4</sup> This narrow and comparatively shallow ancient river bed did not have the capacity to hold a huge amount of water caused by a sudden increase and this heightened the intensity of the flood in the district of Jalpaiguri.



Map 4.2: River Course of Tista in Rangpur before the Flood of 1787

Source: John E. Wilson, ‘A Thousand Countries To Go To’: Peasants and Rulers in Late Eighteenth-Century Bengal; *Past and Present*, No. 189, November 2005.

A normal monsoon which could be categorized by standard rainfall between the months of July and September was preferably suitable for the continuation of regular cultivation of crops. But a violent monsoon could cause a devastating flood when “the annual inundations if sudden in the mouth of Assar [June-July] are extremely destructive, for the Aumun [winter rice] is at that time growing and tender and the *Ous* [spring rice] is ready to cut.”<sup>5</sup> But in the case of 1787-calamity

the first account can be traced from the District Collectors report where it has been mentioned that:

“on the 28th May the zamindars of Kochwara attended in a body on the Collector, and presented a petition to him, while he was engaged in forming a Land Settlement for the year. Their petition set forth that three months' incessant rain had entirely destroyed the rabi or spring harvest, and that they were utterly unable to enter into fresh engagements for their lands based upon the amount of revenue paid by them in previous years.”<sup>6</sup>

The unprecedented heavy rain of the year which had started from 26th March resulted into the destruction of crops and caused a great distress for the peasants who abandoned their fields in large numbers. In this situation the cultivation of the *kharif* or winter rice crop could not possible due to the overflow of the rivers and the condition was farther aggravated by the coming of monsoon. The whole of the low and higher-low land and their production were collapsed as a result of submersion under the water which “prevented the seed from germinating, and that even the high lands, which they had attempted to bring under cultivation, could not be properly attended to or weeded, and that, in consequence of the growth of weeds and jungle, which had choked the rice, all such lands had been turned into pasture for the cattle.”<sup>7</sup> Even after more than three months of the commencing of the flood the Board of Revenue had yet to recognize the issue of crop destruction or other hazards, intensified by serious inundation; while in the meantime the situation became so extreme “that in all parts of the District the cultivators had been obliged to construct platforms to save themselves and their families from drowning, but that many lives had been lost.”<sup>8</sup> After a brief pause of few days' rains started again with increase violence on the 1st August when the peasants just began the cultivation. Board of Revenue now had to recognize the critical condition, arose out of the overflow of the rivers which caused a major damage to lands; and agreed to provide necessary assistance to the zamindars and peasants by extending any possible reduction of land revenue in accordance with the state of cultivation.

The situation was added to a violent discharge of waters of the river Tista, resulted from the continuous heavy rains in the monsoon. The course of Tista had always remained a matter of uncertainty which ever moved “its main stream through the western part of Rangpur and through Dinajpur, till it mingled its waters with the Atrai and other streams, and finally made its way into the Padma or Ganges.”<sup>9</sup> Due to the maximum rain of 1787 the Tista carried down a huge amount of sand from the hills holding within its main watercourse which formed an obstruction in its way

and this resulted in the overflow of waters in the both side of its banks. This increased water ran through another channel which reached to the Ghaghat.<sup>10</sup> The channel of this latter stream did not possess the capacity to carry off this large volume of waters and consequently the water of the Tista extended itself over the whole District which initiated immense destruction to life and property. But finally it found a new and spacious channel through which it began to flow during the post-flood period. This great flood took place on the 27th August; and on 2nd September the Collector of Rangpur reported to the Board of Revenue that " multitudes of men, women, children, and cattle have perished in the floods; and in many places whole villages have been so completely swept away, as not to leave the smallest trace whereby to determine that the ground has been occupied."<sup>11</sup>

The large scale destruction of crops and the lives of people eventually led to a famine. But it was not known, what was the actual number of people who died during the flood and famine. One account, however, informed that 152 households, out of a total number of 287 households in a village of Rangpur perished during the flood of 1787 and the famine which followed.<sup>12</sup> The damage of crops resulted in the unprecedented rise of food prices; coarsest rice, which was in earlier extraordinarily cheap, rose rapidly in price from 23 to 20 seers per rupee (from 4s. 9d. to 5s. 5d. per hundredweight), and it was almost impossible for the poorer to obtain at this rate.<sup>13</sup> In these circumstances, the Collector attempted to lessen the misery by preventing all exportation of grain from the district, and acknowledged the necessity of transportation of huge quantities of rice from the large grain storehouses (*golahs*) into the interior of the District where the crisis was more intense. But this restriction was withheld by order of the Board of Revenue early in October.<sup>14</sup> Moreover, in order to provide relief to the destitute, collections of revenue were suspended for a period of two months and decision was taken for feeding the starving poor who were daily flocking into the town in search for food.<sup>15</sup>

The situation was gradually developed and the winter crops (*kharif*) raised the expectation that the harvest might provide a good amount of production. But another recurrence of calamities of the season was yet to come; a cyclone afflicted over the stricken country. Early on the morning of the 2nd November, after a period of great loss of crops when rice was getting into some maturity, "the wind began to blow with great violence from the north-east, attended by heavy rain, and continued to increase in force until the afternoon, when the wind suddenly changed to the east, and came on to blow a furious hurricane which lasted for about ten hours."<sup>16</sup> This cyclone

ravaged the whole area with such violence that “hundreds of trees were blown down or torn up by the roots; the bungalows of the Europeans were almost all unroofed, and there was total disappearance of thatched houses which could hardly stand against the vigour of the cyclone.<sup>17</sup> Six thousand poor during the period of these calamities were receiving daily rations of rice at the Civil Station, and among them, forty died in the course of the night near the Collector's house.<sup>18</sup> The mortality in the town of Rangpur was much greater and it was estimated that in the course of this disastrous year Rangpur District had lost one-sixth of its inhabitants.<sup>19</sup> In pargana Panga half the populations were disappeared.<sup>20</sup>

East India Company felt the necessity to intervene into this situation in order to improve the existing norms of transport as well as to connect the distressed areas with better supply of grains. The Collector of Rangpur and other distressed Districts were instructed to estimate and acknowledge the amount of grain in store in the various marts and granaries of their Districts, and to communicate the current prices of grains to the Board of Revenue without any delay.<sup>21</sup> Company attempted with much rapidity to remove the barriers in the way of free exportation of grain on the part of the merchants and at the same time penalties were issued against the monopolists.<sup>22</sup> Moreover, the Collectors were instructed to initiate an enquiry on “complaints of the refusal of any one having grain in store to sell it at current prices, to ascertain whether he had more than was necessary for his own consumption and the probable wants of the locality; and if so, to put up the grain to auction in small lots.”<sup>23</sup> But all these measures had been undertaken by the Company only after the 4<sup>th</sup> June 1788; and until then “the Collector was directed to desist from interfering in any way with the purchase, sale, or transport of grain.”<sup>24</sup> The investigations estimated the losses of the year which was resulted from the remission of Government revenue to the extent of *sikka* rupees 234,622, or £ 25, 417 out of a total assessment of *sikka* rupees 1,242,484, or £ 134, 602.<sup>25</sup> In 1787 Rangpur had received added number of *ryots* from the Pargana Andua of Dinajpur which adversely effected the land possession ratio of the former and the situation got more intense in 1788 when *Jummabandi* (rent assessment) “caused great clamours, incredible desertions [which] affected the district in such a manner that.....years [would] be required to bring it into its flourishing state.”<sup>26</sup> The desertion of land of a district, caused by the migration of *ryots*; or peasant unrest or even the increasing emigration into one district resulted in the collapse of any possibility of inter-district transportation of crops since the pattern of cultivation was seriously affected by these tendencies which threw out the district into

the sphere of grave uncertainty. Thus, the Company had to concentrate into the intra-region transportations of crops of a particular district during the famine of 1787-88.

But in practice, the Company despite of having an unflinching attitude had to go through a process of negotiation with the local merchants or grain dealers. Arrangements for negotiations had been made even for the districts such as, Malda, Dinajpur which could not remain far from the hazards, produced by the famine. In regard to the dealing with the merchants, Company was not in a position to make any 'fair' bargain or strict instruction to the merchants since their (merchants') position were at the head of an organized network of trading activities, hierarchically arranged and extended over a large catchment area.<sup>27</sup> This enabled the merchants to go into the far-flung parts of the districts where they could circulate their stocks, accumulated by purchasing the internal surpluses of available food, with greater ease and profit and in exchange of that they sought for a free market of state control by temporarily suspending 'all gunge duties' and by elimination of all subjective duties in the prices of food.<sup>28</sup>

Silk industry in north Bengal was also seriously affected by these natural calamities. The destruction of mulberry and cotton during the cyclonic flood in 1787 created high prices for raw silk and between March and November 1788 the rate was increased to 100 per cent with a 200 per cent rise in the prices of rice.<sup>29</sup> On the other hand, since the famine of 1769-70 the diminishing rate of Company's investment in the silk industry of the province caused a sharp decline in the prices of silk-products. In fact, through the *dadni* system (advance payment to the weavers for selling their product to the Company at a minimum price) the Company had already fixed the subsistence of these artisans at the very lowest level. Moreover, the 'agency system' introduced in 1787- 9 had further restricted the entry of the Indian traders<sup>30</sup> which subsequently constricted the market availability and prices for the silk and cotton weavers. In addition to this the destruction of raw-material (i.e. mulberry and cotton) in 1787-88 aggravated the declining plight of the artisans to such an extent which could afford any further deterioration. These factors together eventually led to joblessness of the silk-weavers; and vanishing of their capacity to buy food. As a result a large numbers of silk-winders (*naqads*) were died in Malda and Rangpur during the famine of 1788.<sup>31</sup> The flood of 1787 (1194 B. S.) had been considered by the Company as an 'epoch in the history of Northern and Central Bengal' and alarmed by the constant loss of revenue resulted from the fickleness of the river Tista, the Collector of Rangpur was instructed to 'construct works to keep the river in its course' for which '[t]wo lakhs of rupees

were sanctioned and 12, 000 men employed in the work.<sup>32</sup> But such a river like Tista which could hardly help itself to remain in its course; as in the early part of nineteenth century it again abandoned its course and ran towards west upto forty miles in the upper part of its course.

## II

### ***Rainfall, Society and Economy: Floods and Crops in Nineteenth and Early Twentieth Century North Bengal***

In north Bengal half of the average rainfall of the year was concentrated during the months of July, August and September and this was caused by the monsoon winds coming from the Bay of Bengal. The hilly part of northern Bengal witnessed more rainfall than the other parts due to the presence of the Himalayas. The quantity of rainfall had varied during the monsoon season though sometime increased by cyclonic storms from the Bay. Variations in rainfall produced blights in the district of Darjeeling. In the *terai* part (foothill part) of the district there were two kinds of blights – *hatina*, caused by excessive rainfall and damaged rice crops; and *magha*, caused by the years of scanty rainfall.<sup>33</sup> On the other hand, in Malda, floods of a destructive character were of frequent occurrence and between 1850 and 1870 there were three severe inundations which caused great sufferings in all parts of the district, especially in the low lands along the rivers. These floods were not so much produced by the heavy rainfall on the spot but took place due to the abnormal rise in the rivers as a result of rainfall at the upper part of the rivers.<sup>34</sup> In 1856 a very severe flood was occurred in the Ganges. The Murshidabad embankments burst at Lalitakori, the whole country below was inundated, and the crops and large numbers of cattle were destroyed. The District of Murshidabad had to witness of several serious floods in 1856, 1866, 1870, 1885 and 1890 caused by the rivers. Among which the floods of 1870, 1885 and 1890 were most severe. The Laltakuri embankment in the Mushidabad district had been broken by the rising water during the floods. In the district of Rajshahi floods of severe magnitude which caused serious damage to the harvest took place in 1838 and 1865. The flood in 1865 was caused by the excessive rainfall.<sup>35</sup> Though the town Rampore Boalia, the sadar town of Rajshahi district was protected by a 7 miles long embankment but had suffered from the periodical overflow of

waters.<sup>36</sup> One such serious incident took place in 1864 when the embankment was flooded by the Ganges and a greater part of the town ‘including the Government officers, was swept away’.<sup>37</sup> However, the floods occurred since 1870-71 was different in nature and scale than the earlier floods. District-wise documentations of rainfall, embankment, agriculture, public health etc. in the *District Gazetteers* had reached to a moderate extent by the colonial administration to deal with the ‘facts’ about the floods and other issues. But the publication of these gazetteers was started only since the beginning of the twentieth century. It was until the beginning of the second decade of twentieth century when Government perceived the necessity to compile the scattered evidences and documents regarding the floods occurred in north Bengal. Government of Bengal has appointed the North Bengal Flood Committee in February, 1923 under the chairmanship of Mr. G. T. Huntingford, Officiating Chief Secretary, Public Works Department, Government of Bengal, in order “to prepare a series of maps showing the actual position and quantity of the rainfall immediately preceding some of the more important floods.....which had actually occurred in North Bengal during the period 1870 – 1922.”<sup>38</sup> After analyzing the Administration Report of Bengal from 1870 to 1922 and the District Gazetteers of all the districts of Rajshahi Division, the committee has presented a list of important floods. It had classified all floods under four heads - *Catastrophic* which involved considerable direct loss of human life and great destruction of cattle and crops; *Severe* that incorporated small loss of human life and significant destruction of crops and cattle; *Moderate* floods which did cost sizeable damage to crops and cattle but no loss of human life; and *Slight* which involved minor damage of crops but no direct loss of cattle or human life.<sup>39</sup>

### ***Floods between 1870 and 1879***

Occurrences of floods in north Bengal have been very often attributed to the excessive or abnormal rainfall and increase of water level in the rivers. In 1870 Murshidabad embankment at Lultakori on the Bhagirathi burst upon – as a result the whole district was flooded and the flood water swept across the district into Nadia; and great damage was done to the Eastern Bengal Railway. In the Bagri, or eastern half of the district, a great portion of the *aus* rice crop was demolished by the floods; and nearly all the *aman* rice growing in the low lands was plunged.<sup>40</sup> The rice crop, however, in the Rarh or western half of the district was good, and the outturn as it was informed to have been above the average. The cold-weather crops in many parts of the

district were destroyed by a third rise in the rivers.<sup>41</sup> Despite of prevalence of a good amount of food, though other than rice, as had been argued, it was ‘by no means an easy matter for many of the suffering cultivators, who were living on *machans*, or bamboo platforms raised above the waters.’<sup>42</sup> Though relief operations were conducted by the government but these ‘only entailed an expenditure of Rs. 3,000, for the land in many parts was benefited by the rich deposit of silt left by the receding waters.’ There was an exhibition during this period of a spirit of mutual assistance among the people which coupled with governmental relief assistance had prevented, as it was reported in the Annual Report of the Collector in 1870, any ‘single death from starvation.’<sup>43</sup> Even though the crops in low-lying places were almost entirely destroyed by submersion, but the peasants elsewhere were benefited by the floods which had brought down an abundant supply of water that allowed them to produce a higher quantity of rice from their lands than they had obtained for several years past.<sup>44</sup> The Collector attributed high range of prices prevailed during 1872-73, which were on an average above those of the previous years, to the serious diminutions in stocks which had been caused by the inundation of 1870 and its successive consequences.<sup>45</sup> In the exposed lands in the north of the district, the damage of the developing crops was excessive, but in the southern part of the district, due to its positional immunity from any devastating rush of flood water, produced an ‘unusually fine harvest’.<sup>46</sup>

The Bhadrihat thana of Murshidabad, as reported by Bankim Chandra Chatterjee, though had suffered from inundation only to a slight extent but three-fourth of *bhadoi* crops had been destroyed.<sup>47</sup> Part of thanah Dewanserai on the banks of the Bhagirathi had suffered a good deal. The land outside the embankments had been wholly submerged, and no crops were expected. The crop submerged was wholly *aus*; no *aman* was grown here. The rice bearing lands such as - Lakhijolah, Boojoomeah, Hichakhati, Babupoor, and Koolgatchi, were under water.<sup>48</sup>

Apart from the different parts of the district of Murshidabad, many parts of northern Bengal were affected by the floods of 1870. W. Campbell, the Officiating Deputy Collector of the district of Malda had mentioned about the report which depicted the condition in the following manner:

“...[in] Malda, Gomastapur, Kaliachuck, Gajol, Nowabganj, and Gargoriba, the rising of the rivers has put nearly all the *bhadoi* paddy under water, and if the rivers continuing rising, the greater portion of it will be destroyed.”<sup>49</sup>

N. S. Alexander, the Officiating Collector of Malda wrote to the Commissioner of the Rajshahi Division about the impact of the flood in different police stations of Malda: police station English Bazaar - a twelve *anna* portion of the *bhadoi* crop had been lost; police station Malda – a fourteen *anna* portion of the *bhadoi* crop had been lost; police station Kaliachack – eight *anna* portion of the *bhadoi* paddy had been lost and this was only paddy grown in this quarter of the district; police station Gomastapur – twelve *anna* portion of the *bhadoi* paddy and eight *anna* portion of the *aman* paddy had been destroyed; police station Shibganj – one *anna* paddy was expected while the rest was being destroyed; police station Khurba – only ten *anna* crop was expected; police station Gargoriba – only five *anna* crop was expected.<sup>50</sup> The delayed response of the government had prevented them to collect any further information about the extension of the flood in the Rajshahi Division. After the water had subsided, the Government had decided to ‘visit the localities affected by the inundation or depute a proper officer to do so’, but before doing that it was declared most surprisingly that ‘the almost entire destruction of crops which the Collector has reported ....has been very much exaggerated, and accordingly awaits a further and a fuller report.’<sup>51</sup>

The flood had ravaged a greater part of the district of Rangpur. Indigo, which was reported on from only one station, was all damaged by the heavy rain. The flood had also destroyed the *aus* crop in the district, whereas the *aman* crop had suffered only slight damage. F. G. Millett, the Officiating Collector of Rungpur while coming by the steamer from Sirajganj to Kaliaganj had noticed that:

“the houses and sheds built on the churs in the river Jumoona (or Dowkolea or Brahmaputra, for it is called by all three names,) were mostly under water up to their roofs, while the people in the villages on or near the mainland were gradually being swamped out of their houses, and some boats were kept anchored close by in readiness for flight should the water too rise.”<sup>52</sup>

Such a magnitude of inundation had not been witnessed by people of the region for 12 years. In a letter to C. E. Lance, the Officiating Commissioner of the Rajshahi Division, J. Tweedie, the Officiating Magistrate of Pabna had written the following accounts of the floods in the district:

“The rivers, great and small, the Ganges, Bramapootra, Oorasagur, Echamuttee, and others, have risen three feet above their ordinary high level. All along the borders of

the Jamoona and Oorasagur, and also on the extensive chur lands which extend between these rivers, the land has been submerged. Villages are seen rising as it were out of a huge still, inland sea. Cattle are left without shelter....The jute crop has suffered as badly as the amun rice.”<sup>53</sup>

The causes of the rise of the water had been attributed to the high tides or high winds, which was blowing from south-west for almost sixteen hours and had prevented the out-fall of the large rivers into the sea.<sup>54</sup> Rainfall within the district which was only slightly below the average was not, however, treated as the main cause of the rising of water or the inundation. Throughout the Sirajganj *thana* the *aus* crops on the low lying lands had suffered to a considerable extent being the estimate for this *thana* as 6-anna crop only.<sup>55</sup> Most of the jute crop on the churs in the Jamuna river had been swept away, and what was sown late in consequence of drought had been entirely submerged. To the north of the district of Pabna, many villages were entirely under water, some of which were partially abandoned, and there was difficulty in procuring fodder for the cattle.<sup>56</sup> The destruction of food crops in the district was so widespread that rice ships were allotted for visiting the flooded localities in order to prevent any rise in prices.<sup>57</sup>

River embankments had suffered great damages by the floods of 1870 when several embankments were broken by the floods. The Ganges river embankment had been broken through at Boalia and at Talaimari (about two miles from Boalia) by the force of the stream.<sup>58</sup> It was proposed after the floods that the complete flooding of the town could be averted by continuous fortification of the embankment. Narad river had also broken through the Nator road in two places near Kapasia, and measures had been taken to repair the damage.

The 1871 flood was caused by unprecedented rainfall in the monsoon period. The monsoon of 1871 had carried a large amount of water with it. Though the year 1871 had witnessed a great quantity of rainfall but it had widely varied from district to district in north Bengal. During the second half of August rainfall had increased considerably and in September there was excessive rainfall in different parts of north Bengal.

Table. 4.1

Rainfall in the second half of August and 12<sup>th</sup> to 16<sup>th</sup> September, 1871

Place	% of Rainfall in August	% of Rainfall in September
Rangpur	87	63
Dinajpur	67	153
Bogra	80	207
Rampur Boalia (Rajshahi)	69	101
Sirajgunj	11	103
Pabna	7	298
Malda	33	136

Source: Extracted from P. C. Mahalanobis, *Report on Rainfall and Floods in North Bengal, 1870 – 1922*, p. 51.

There was a huge elevation in terms of rainfall from August to September in the district of Rajshahi and Malda. On the other hand, rainfall for the whole month of August was low, in fact, deficient in some places. There were very minimum surplus of rainfall in Pabna, Dinajpur and Rangpur in August. However, in the first week of September considerably greater rainfall than the average took place in the eastern part of northern Bengal where the volume of excess had varied from 50 per cent to 150 per cent.<sup>59</sup> From 12<sup>th</sup> to 16<sup>th</sup> September rainfall was inexorably maximum in the south-eastern part of north Bengal. Though the month of September had witnessed moderate excess of rainfall in some places but rainfall at Jalpaiguri ‘was in defect by 46 per cent and at Buxa by 19 per cent’.<sup>60</sup> In Malda (1871), the river Mahananda overflowed its banks and flooded the adjacent villages and caused serious harm to the cattle, *bhadoi* crops (reaped in August or September) and mulberry; and the town of English Bazar and the lower portion of the police stations of Harishchandrapur and Kharba were flooded.<sup>61</sup> Floods occurred in Malda had been chiefly attributed to the abnormal rise of water-level in the rivers due to rainfall

in the hills instead of local rainfall. Most of the rivers and streams which were running through Malda had originated in the northern mountains and were vulnerable to sudden freshets produced by the melting of snow and excessive rainfall in the hills. In the *diara* tracts of the district the flood caused changes in the main stream of the river Ganges which was resulted in cutting away of cultivable and dwelling areas that turned ‘the inhabitants of whole villages ...in a night to the position of landless labourers.’<sup>62</sup> But this on the other hand had created opportunities for the formation of new *char* lands by the silt deposits which were fertile for cultivation. The excessive rainfall in the Rajshahi district in 1871 commenced from the end of August and continued till the second week of the October.<sup>63</sup> The district was flooded by water. This flood, which was said to believe the ‘highest floods on record in the district’, caused much damage to the cattle due to the want of fodder and the people were compelled to leave their original houses and take shelter to the high places.<sup>64</sup> When water had subsided cholera was broke out in an epidemic form in the district of Rajshahi.<sup>65</sup> Deaths were reported from the district, though the number was very small. But there was a terrible loss and mortality of cattle along with the destruction of crops.<sup>66</sup> The *Hindoo Patriot* informed that ‘The oldest man living does not remember to have seen such a deluge, several of the fairest villages have been swept over by the flood, looking like one vast sheet of water studded here and there with huts and trees.’<sup>67</sup> The embankments on the left bank of the Bhagirathi in the Murshidabad district gave away and the water from that and other directions swept into Nadia district and carried away portions of the Eastern Bengal Railway and poured into parts of Jessore.<sup>68</sup> The increasing quantity of rainfall had contributed to the rise of water-level in the Ganges which was primarily responsible for this flood in Malda and Rajshahi. In contrast to these areas rainfall in Darjeeling, Jalpaiguri and Buxa i.e. in the northern part was strikingly low. ‘Thus water coming from the north was not an important factor’ for the inundation at Malda and Rajshahi, especially in this case.<sup>69</sup>

In 1874 due to a high flood of short duration Murshidabad embankment was again broken at Lultakori; but the river fell rapidly and little damage was done. In 1874 August ‘moderate’ flood was occurred in the district of Rajshahi and Pabna. *Amrita Bazar Patrika* reported that:

“In the north-western part of the country [Bengal] the Ganges flooded the fields into a vast sheet of water... The Padma swelled so much that Goalundo is nearly under water and many parts of Pabna have been washed away, and crops have been destroyed... Gradually the water

will spread over Bengal and if the water of the Ganges increase at this rate then within a month a great flood will occur in Bengal.”<sup>70</sup>

The flood in Pabna was due to the rise of water level in the Ganges which was complemented by the rising water in Brahmaputra coupled with the local excess in rainfall. However, water was only limited to the extreme south east and the ‘extreme north’, and it flowed down swiftly without any obstacles as there was no ‘railway lines in existence at that time.’<sup>71</sup>

In 1875, floods occurred in Malda and Pabna. Rainfall in the month of August was high in some places and it was increased in average to 45 per cent in Malda, 92 per cent in Chanchal, 33 per cent in Sirajganj, and 58 per cent in Pabna throughout the month.<sup>72</sup> However, the percentage was glaringly increasing in day to day rainfall during the end of the month. There was very minimum rainfall in the extreme north. The flood was again attributed to the excess in local rainfall which triggered the rise in water level in the Ganges which seldom had the capacity to hold increase water in its river bed in this region.

The heaviest flood in Cooch Behar ‘remembered by the oldest men’ in the country occurred in July 1878, ‘the like of which had not been seen for 40 years’.<sup>73</sup> The rainfall in April was seasonable and in May it was 12 inches. But from June onwards rain was started to falling heavily and in July it appeared in its most violent form. The flood wrought havoc in the land. Early rice could not cope up with this maximum amount of water which washed away the fields.

“Starting from the river at the back of the Palace, the grounds of which [were] protected by a *bund* ...overstepped by the flood,...the people were all driven to the top of their houses by the flood when at its highest, and it was necessary to send out boats with loads of *chura* or dried rice to distribute, as in some places the cottiers were literally in danger of being starved.”<sup>74</sup>

The whole area from Cooch Behar to Dhubri came under one vast sheet of water. Crop yielding areas had gone under the water. Though the floods had subsided quickly from the high lands but it took several days to remove the low lying lands from water. As a result serious damage was caused to the standing crops. The early seedlings were more or less damaged and in some places were totally covered up by the floods, and recovery from this took a very late one which ‘was fatal to all hopes of a good harvest.’<sup>75</sup>

The flood of 1879 was due to heavy rainfall during the end of the August. The rainfall had increased to 100 per cent in many places and to '200 per cent over a large area.'<sup>76</sup> Rajshahi was affected by this flood. Despite of heavy raining in the north the situation did not rise in a condition of inundation in the south of the river Tista. The smooth flow of water by the tributaries of Tista helped the situation. Apart from the increased local rainfall, the considerable rise of water level in the Ganges in northern India (UP., Bihar) was also responsible for the overflow of waters in northern Bengal. It was observed that the flood of 1879 in Rajshahi was 'a typical river flood primarily caused by the heavy rainfall in U. P. and Bihar and the consequent rise of the Ganges level.'<sup>77</sup> But in Murshidabad the flood was very. 17 small breaches had appeared the embankments. As a result the whole district was flooded and rails were topped in many places on the Eastern Bengal Railway.

### *Flood of 1885*

The flood of 1885 was lasted about one month spreading in many parts of north Bengal. In severity and duration, the flood was unequal to those of 1823 and 1871; the former of which was said to have persisted nearly two months, and the latter of which was known to have continued for six to seven weeks. The damage commenced by the breaking of the Murshidabad embankment on the 23rd of August near Laltakori where the water penetrated under the embankment and burst up in springs on the other side, and eventually the embankment was diminished and a breach of 200 feet wide was immediately formed.<sup>78</sup> This occurred at 11 p.m. and by 7 a.m. the next morning the breach had widened to 800 feet. On the 8th of September it was 2,000 feet in width, and it ultimately reached to 2,270 feet, or nearly half a mile. The discharge of water for the next three weeks (from the 24th of August to the 14th September) was amounted to about 50,000 cubic feet per second.<sup>79</sup> The flood had inundated a large tract of the district and expanded to 1,250 square miles or more than one-half of the total district area.<sup>80</sup> In the initial stage as the breach was comparatively narrow there was a high velocity of water whereas later on there was a wider breach and a lower velocity. On the 25th of September, the discharge had fallen to about 14,000 cubic feet, and was rapidly decreasing. The embankment having breached, the flood flowed over the country, and after filling up the low lands known as

*Kulluntra*, in the south of Murshidabad, reached the 61st mile of the Eastern Bengal Railway on the 29th of August. Meanwhile the Gangetic flood, pouring down the Mathabhanga, breached the embankment near the Ramnaghur station of the Eastern Bengal Railway on 28th August.<sup>81</sup>

The flood of 1885 was attributed to the floods in the Ganges, aggravated by an unusually heavy rainfall over the area affected, at the same time as the Ganges floods were at their worst. However it was calculated that very severe floods seemed to appear at the regular intervals of about 17 years.

Between 1801	and	1823	.....	22 years
”	1823	”	1838	..... 15 ”
”	1838	”	1856	..... 18 ”
”	1856	”	1871	..... 15 ”
”	1871	”	1885	..... 14 ”

5/84 (Average about 17 years)<sup>82</sup>

It can be noticed from the above statistics that intervals between the occurrences of floods tended to be shorten and moreover, high floods caused to disastrous inundations had been ‘far more common in the last 30 years than the records show them to have been previously.’<sup>83</sup> For the temporary relief from the disaster relief circles were built in the affected areas, and a Central Committee had come into being in Calcutta to receive donations and ‘organized relief for those forms of distress with which Government agency could not adequately cope’.<sup>84</sup> In 1890 there was a similar inundation like that of 1885 due to the Lalitakuri embankment bursting again.<sup>85</sup>

Flood of 1885 in Malda was also the result of an abnormal increase of the water level in the Ganges. Throughout the August Ganges had to witness a maximum rainfall in its upper course which fell under northern India and this excessive rainfall contributed to a considerable increase in the water level in the river bed. In the flood of 1885, parts of Kaliachak, Sibganj and Nawabganj police stations of Malda were affected.<sup>86</sup> But it was observed that in the month of September rainfall in different parts of north Bengal was extremely high and on 1<sup>st</sup> September Malda, Gajol and Sibganj had 3.15, 3.75, and 4.02 inches of rainfall respectively.<sup>87</sup> It was observed that ‘heavy local falls in the flooded area itself together with a very high level of the Ganges were mainly responsible for the present flood.’<sup>88</sup>

However, though it was stated that the flood ‘was attended with little loss of life’ in Murshidabad but the poorer classes were, for some time, put to considerable straits for food, and the cattle

suffered from want of grass.<sup>89</sup> T. H. Wickes in the *Report on the Inundations of 1885 in the South-Western Circle* had summarized the impact of the flood in the following manner:

I saw many scores of villages in which the thatched roofs of the houses were alone visible, the country being completely submerged. There was no epidemic. The rice crops were destroyed over a large area, but the deposit left by the flood will have fertilized the soil. Bumper *rubbee* crops have followed, and the harvest will be improved for some years to come. In the immediate neighbourhood of breaches the soil is injured by the deposit of pure sand; but where the rivers naturally overflow, and beyond the immediate neighbourhood of breaches, the country receives a rich deposit of silt – an invaluable blessing in a country where the use of manure is practically unknown. The railways suffered very severely both in loss of traffic and by the lines being topped and breached.<sup>90</sup>

The *Report*, however, did not include any number of casualties. ‘The first and most necessary’ step which was undertaken to avert any future occurrence like this, was ‘the retirement of the embankment from the treacherous soil near Laltakori, to good ground where it can be held against any flood.’<sup>91</sup> The proposed measure was to be followed by the construction of seven miles of embankment at a cost of Rs. 1, 80, 000 but it did not materialize due to shortage of funds. The next method was the provision of sufficient waterway on the Eastern Bengal Railway between Ramnagar and Aranghata. Moreover, ‘for the safety of the country liable to damage in case of high floods, orders [had] issued for the immediate construction of a short retired line in the rear of the breach of last year, which it [was] hoped [would] be sufficient for present safety...’<sup>92</sup> The Central Committee which was constructed for conducting relief in the district of Murshidabad had received Rs. 65,665 in subscriptions, and expended Rs. 37,000 for the victims. The residual amount was devoted ‘to form the nucleus of a distress fund to be applied promptly on the occurrence of future calamities by famine or inundation in Bengal’.<sup>93</sup>

However, situation was not identical in all the parts of northern Bengal. As a result of total loss of rice in the fields there were many places where the people were suffering from want of food.

*Amrita Bazar Patrika* wrote on 17<sup>th</sup> September that:

“...in many parts of Bengal the people [had] eaten up their last grain. What they had has been washed away by the great inundation which [had] flooded almost all the districts of the Province. Hundreds of villages [had] been totally destroyed, and men, women and cattle swept away by the torrent. Thousands of people in those places [had] been rendered homeless and [were] likely to die of starvation, if no material help [was] sent to them at once...”<sup>94</sup>

For Malda, too, relief measures were undertaken by the Government. Through this relief work, it was claimed that, 42,491 persons were relieved gratuitously at a cost of Rs. 11, 579 and 6, 944 persons were backed up with work.<sup>95</sup> Though the floods did not cause loss of any human life but it had profound impact on the changing tracts of main stream of the river. There were considerable loss of property and standing crops in the *diara* part of the district which reduced the villagers 'in a night to the position of landless labourers'.<sup>96</sup> But in a sharp contrast to this, it was said to believe that the layer of silt deposits brought out by the floods could ensure a good crop in the forthcoming years. Water had flowed down in a regular basis in many parts where there was no rail line which seemed to be a major obstruction in the smooth flow of water. The absence of Sara-Sirajganj (1913-15) and the Santahar-Bogra (1893-96) lines had provided had provided the condition for a 'good drainage'.<sup>97</sup>

### ***Floods between 1886 and 1898***

Some parts of north Bengal had witnessed heavy rainfall in September of 1886. This heavy rainfall caused floods to some areas. Ganges level above Rampore Boalia raised very high towards the end of August and the beginning of September. This time, however, northern part of northern Bengal had suffered from the flood which reached to as far as Cooch Behar. The diversion road from Matigarrah to Kurseong near the 5<sup>th</sup> Mile was washed away by heavy rains of October. The unprecedented excessive rains in the month of June, July, August and September produced devastating landslides on the Hill Cart Road, Peshoke, and Tista Valley Roads.<sup>98</sup> Bogra had a massive rainfall in the month of June, 1886, 'when the extraordinary rainfall of 18 inches took place between the hours of 11.30 p.m. and 1 a.m. on the night of the 30<sup>th</sup> June'.<sup>99</sup> As a result, the town of Bogra and a greater part of the district were flooded and portions of railway lines were swept away.<sup>100</sup> Cooch Behar was also flooded by the overflowed water.<sup>101</sup> Though the damage done to the crops was comparatively low in this case, but there were many cases of loss of cattle in the State.

The 1890 flood in Pabna Sadar Subdivision, produced by the river Ichhamati and Padma caused serious damage to the roads and '[a]lmost the whole of the town was more or less under water for nearly a month'.<sup>102</sup> In the town of Pabna the southern portion of the civil and criminal courts

were flooded by the Ichhamati. For protecting the district from future inundations ‘an embankment with sluice-gates was constructed along the right bank of Ichhamati...’.<sup>103</sup>

The 1892 flood had extended to a greater part of north Bengal. In the first week of July, 1892 there was unprecedented rainfall in Raiganj, Balurghat, Kurigram, Siliguri, Mathabhanga, Cooch Behar. River Dharla rose to an abnormal height due to the excessive rainfall. The district of Dinajpur was considerably affected by the flood. In Dinajpur the flood, started on 9<sup>th</sup> July, 1892 caused by the heavy inundation from the Atrai River and, combining with the Gabura and Ghagra streams on its way. The flood ‘swept down on the town of Dinajpur from the north-east and washed large numbers of the inhabitants of the northern and eastern quarters out of their houses’.<sup>104</sup> Floods in Dinajpur were of almost annual occurrence. But what took place in 1892 was exceptionally disastrous in the history of the district.

At one time it seemed likely that the whole of the central portion of the town might be destroyed, but the timely cutting of the Darjeeling road let the water off and relieved the pressure. A dangerous feature of this flood was that its first appearance in the evening, and the darkness which ensued added greatly to its terrors.<sup>105</sup>

The flood caused serious damage to the houses. Money was allocated to the sufferers for their maintenance and repairing of their houses. Though the river Atrai and Punarbhaba rose to the flood but it was Atrai which violently hit the country with maximum force of its water. The enquiry which was conducted to decipher the main reason of the flood found that ‘the railway line, which bisects the district from east to west, was in large measure responsible for the damage done by holding up the flood water coming from the north’.<sup>106</sup> The Raiganj-Parbatipur-Kurigram railway line held water of Atrai for long time. Increased water from the hills expanded and fulfilled the rivers which contributed to the serious overflow from the Mahananda above Kisengunj, from Atrai below Siliguri and near Dinajpur and Chirirbander and from the Dharla below Magalghat and near Kurigram.<sup>107</sup> Mathabhanga and Cooch Behar Suddar Sub-divisions of the Cooch Behar State were flooded extensively in this flood.<sup>108</sup> There was excessive rainfall in several parts of the district of Darjeeling. The *Report on Rainfall and Floods in North Bengal* (1927) has summarized the flood-condition of the Darjeeling district in 1892 in the following manner:

“...on the Tista Valley road traffic was stopped for 22 days, owing to the scouring away of the timber bridge over the Galijhora. ....On the road from the Tista bridge to Rishi the heavy rains of the 12<sup>th</sup> July 1892 caused serious damage, a 60-foot timber bridge and three of 30-foot being carried away and traffic interrupted for some time....[F]rom Darjeeling to Tista via the Runjeet there were heavy slips and the road sunk badly in the 14<sup>th</sup> Mile.... Serious slips occurred on the road from Jore Bungalow to Tista via Peshoke,....

Considerable damage was done to the Terai roads by the extraordinary heavy rainfall between the 2<sup>nd</sup> and 7<sup>th</sup> July 1892; one span of the Champta bridge on the road from Mattigurah to the Hill Cart Road was destroyed by floods, the wing walls of bridge No. 15 on the road from Mattigurah to Kurseong were scoured away, while the road from Mattigurah to Naxalbari suffered most severely, several sections of the bank were breached, .... Several slips occurred, which required the hillside to be cut back in order to obtain the full width of road again...”<sup>109</sup>

Sirajganj was also flooded this time massively. The *Statesman* reported on 21<sup>st</sup> July that “There [h]as been a very high flood this year .... There was a very good harvest both in *dhan* and jute but the field [were] under water and cultivators [were] in great distress...”<sup>110</sup> In Sirajganj the flood occurred as a result of maximum increase of water in Brahmaputra which overflowed the river. In July 1895 the whole Cooch Behar State was inundated by the excessive rainfall and Pargana Tufanganj was completely ravaged by the flood.<sup>111</sup> There was again a chance of heavy flood, which remained though a ‘moderate’ flood, in 1898 in north Bengal due to increased rainfall in the month of September. There was more than 100 per cent increase in rainfall in greater part of north Bengal between 1<sup>st</sup> and 22<sup>nd</sup> September and extraordinarily heavy falls were on the 16<sup>th</sup> September in Mathabhanga (13.10 inches), Falakata (10.65 inches) and Siliguri (8.15 inches).<sup>112</sup> District of Darjeeling had an excessive rainfall which caused damage ‘.. on the hill roads in consequence, traffic on the Tista Valley road being interrupted for seven days’.<sup>113</sup> However, the worst had yet to come for Darjeeling district.

### ***Flood of 1899 in the district of Darjeeling***

The year 1899 has been regarded as the year of the great disaster in the Darjeeling district. Darjeeling’s rainy season of 1899 was exceptionally heavy, with an unprecedented downpour on September 23<sup>rd</sup>, 24<sup>th</sup> and 25<sup>th</sup>. The beginning of the disaster was brought forth by a cyclone on

23<sup>rd</sup> September. (The course of the cyclone has already been described in Ch. II) The cyclone was accompanied with heavy rainfall which continued for three days and the downpour was varied from places to places, as shown in below:

Table: 4.2

Rainfall (inches) at different places of Darjeeling on 24<sup>th</sup> and 25<sup>th</sup> September, 1899

Place	Rainfall on 24 <sup>th</sup> September	Rainfall on 25 <sup>th</sup> September
Darjeeling	5. 30	19. 40
Kalimpong	4. 80	9. 16
Kurseong	4. 67	15. 18
Pedong	4. 42	-
Mongpoo	3. 25	12. 96
Siliguri	-	3. 98

Source: P. C. Mahalanobis, *Report on Rainfall and Floods in North Bengal, 1870 – 1922*, p. 66.

At this same time Tista arose with a flood of huge elevation and spilled over its banks which resulted in pervasive destruction especially at Tista Bazar where almost all the houses were swept away. The flood severely affected the tea gardens and the area of tea actuality ruined was 2000 acres and the value of property destroyed such as – tea, buildings etc. cost more than 10 lakhs of rupees.<sup>114</sup> Large areas of forest were washed away. River Balasan had also come down with huge amount of water which caused serious destruction to the Balasan forest and took away three quarters of forest area into the valley. The carrying down of mud, water, and stones etc. by the constant stream were scattered over a large area and the roads were somewhere obstructed by the trees, electric wires, and several other debris or were utterly wrecked away. The roads were broke in with several cracks, ‘the Cart Road being seriously damaged throughout its whole length from Darjeeling to Ghum, and also at many places between Ghum and Kurseong; while large portions of Tista Valley road practically disappeared.’<sup>115</sup> The railway network had also suffered extremely and the rail lines in several places were hanging in ‘mid-air’ gaps.

The four consecutive natural calamities - cyclone, excessive rainfall, flood and landslips- took a heavy toll in the district of Darjeeling where deaths were occurred among both the Indians and Europeans.<sup>116</sup> Apart from the mortalities, heavy destruction was done to the buildings, railway lines and the tea gardens. E. C. Dozey had provided the following account of sufferings caused by these calamities -

“The railway also suffered considerably, which in some places, notably near 'Mary Ville', had its lines suspended in the air compelling passengers to cross this chasm on a wire-rope way to which a seat was attached....The rushing waters swept away the heavy machinery and buildings ,of the old Cedar Tea Estate, not to speak of doors and windows, and landed the debris at the Tirrianna crossing, which is fully 10 miles below in the Terai. The Poole ridge suffered a similar fate, while animals both tame and wild were drowned in the flood. Finally the total loss to property as computed by competent authority has been estimated to amount to one *lakh* of rupees.”<sup>117</sup>

The river Little Rangit accumulated huge amount of water in its upper stream that triggered the pace of the occurrence of numerous landslips at its banks. At the eastern side of the Mall of Darjeeling there was a series of continuous landslips, most of which were generated from near the top of Observatory Hill. The destruction and the loss of life in Darjeeling had received a broader audience than it had during any previous calamities occurred in the district so far. Quoting from *The Darjeeling Advertiser*, the first issue of this newspaper was published in March, 1899 - E. C. Dozey has mentioned that:

"There is no house, there is no plantation, there is scarcely a road or highway in the district which has not suffered. Owing to the line being washed away at 'Mary Ville' and several other places between Ghum and Darjeeling the up mail was held up at the former station where passengers were forced to shift for themselves and spend the night as best they could in all possible discomfort, arriving the following morning in dandies or rickshaws. . . . About 320 privates and Noncoms of the Munster Fusiliers under Capt. Tizzard and Lt. Henderson worked all Monday and Tuesday in their efforts to unearth the wounded, and dead from the debris of the houses to the east of Observatory Hill which had been engulfed by the landslip."<sup>118</sup>

*The Fairfield News and Herald* had reported the following description and aftereffects of the calamities of 1899:

“Lieut. Gov. Sir John Woodburn announced to the council Thursday that 400 lives were lost through the floods at Darjeeling, capital of the district of that name, in addition to those drowned on the plains. Great havoc has been caused at Kurseong. The Margaretheope estate lost 100 acres and Mealand factory was destroyed. Some coolies

were buried in the ruins of the manager's house, which was partially destroyed. The Avongrove estate lost 30 acres, and 4000 tea bushes. The coolie lines were swept away and many persons were killed, but the exact number is not known. A factory was also destroyed at this place. A huge landslip below St. Mary's seminary destroyed the railroad bridge and completely blocked the road. A breach 30 yards wide has been made and the rails are hanging in the air. It is thought the break cannot be repaired within 30 days.”<sup>119</sup>

*The Argus*, published from Melbourne, provided the account of the natural calamities which was reported from London on 29<sup>th</sup> September, 1899 under the caption ‘*Darjeeling Disaster: Sad Incident – a Family Overwhelmed*’, in the following manner:

“In connection with the terrible disaster at Darjeeling in India caused by heavy rain and landslips, a very and incident is reported. A missionary named Lees and his six children, while on their knees offering up prayers for the protection, were overwhelmed by a landslip. One of the children was saved, but Mr. Lees and all other children perished.”<sup>120</sup>



Plate: 4.1.

Mall-Villa – The Lee House which was destroyed in 1899 floods.

Source: Ada Lee, *Seven Heroic Children: A Great Sorrow and a Great Victory*, p. 145.

Deaths occurred in Lee family had invoked a great sensation among the contemporary European population. Ada Lee, one of the victims among the Lee members, who fortunately succeeded this

disaster, had written a memoir titled *Seven Heroic Children: A Great Sorrow and a Great Victory* which provided an eye witness's account about the disaster. This memoir is of great importance as it depicted the dreadful events accompanied by the live descriptions about the state of suffering of the people. Deaths of Europeans were reported by the Commissioner of Darjeeling to the Lieutenant Governor of Bengal in following terms: "Mall Villas destroyed; lives lost as follows: D. H. Lees's children, eldest girl found dead, eldest boy saved, rest missing. At Ida Villa, Phoebe and Ruth Wallace, Eric Anderson, all dead."<sup>121</sup> Ada Lee had described their apprehension standing amidst the horrible times:

"...steady downpour continued. Added to this began to be the roar of swollen streams and the river below, the crash of landslips, and the fierce uproar of the tempest. Many a timid heart believed that night to be its last on earth; and, .. in many parts of the station a desperate struggle for life was going on— fighting against mud and water, and falling rocks and trees..."<sup>122</sup>

The boys of St. Joseph College, Darjeeling had displayed great effort and bravery as they 'rushed to the scene of the catastrophe and systematically set to the rescue work'. Praising their rescue operation *The Englishman* reported, 'Among the deeds of heroism worthy of mention is the rescue work done by the boys of St. Joseph's College.'<sup>123</sup>

The types of landslides which were occurred in Darjeeling were classified, according to the Swiss terminology, as *Schuttsturze*, i. e. soil slides or soil slips and this *Schuttrutschungen*<sup>124</sup> was caused by slow movements of soil or unconsolidated material along the hill slopes and these movements of soil were common at the lands stretched between Mahanadi and Rangtong rivers.<sup>125</sup> The deduction of soil from the surface by the automated action of running water, and the concurrent accumulation of decomposed products below the sub-soil by chemical activity of infiltrating water are not simultaneously compensatory in slopes covered with vegetation and on the other hand the creation of soil-cap, obviously, does not in itself help to an increase in the surface slope but its erosion from the foot of a slope by watercourses increases the average slope of the hillside. This kind of destabilization or subsidence of the foot of a hill was recorded in the faulted area between the two branches of the Kagjhora in Darjeeling.

The severity of these natural disasters prompted the colonial Government to appoint a committee, consisted of engineers and residents of Darjeeling and to formulate strategies to cope with such

situation in case of future occurrence and to minimize their consequences as well. The committee under Mr. Holland of the Geological Survey of India, after a thorough inspection of roads, buildings, rails and drains; reported that “the landslips were confined to the soil cap, and that there was no reason to entertain any apprehension as to the stability of the site of the station, which [was] founded on massive rock and [was] thus secure” and the causes of the landslips, according to them, were the “defective drainage of sites, excessive lead of drains, imperfect or badly-constructed revetments, neglect to reduce or protect steep slopes, defective supervision of building sites, quarrying in unsafe localities, etc.,...” and at the same time, also hinted out the counteractive methods that were to follow in order to avert the future danger.<sup>126</sup> Moreover, these measures took a final shape in 1900 when Bengal Act I of 1900 was introduced, based on the recommendations of the committee, which conferred increased power and responsibilities to the local authorities, and on the other hand a complete set of building regulations had come into force that vested full power to control the diggings and construction for buildings and banned the erection of buildings on any site considered vulnerable to the natural disasters; as a result the following years had witnessed more efficient prevention and comparatively less damage of life and property as well.<sup>127</sup>

### *Floods in early Twentieth Century North Bengal*

#### *Floods between 1902 and 1915*

The district of Jalpaiguri was severely flooded in 1902 and in 1906 floods which were among the most severe floods the district had ever witnessed till the nineteenth century. It has been argued that the uninterrupted rainfall in the Darjeeling Hills and in the Jalpaiguri and Cooch Behar contributed to an exceptionally maximum quantity of water into the Tista which probably overflowed its banks and resulted in floods.<sup>128</sup> However, it is necessary to take into account that in the central part of north Bengal i.e. in the district of Rangpur and Dinajpur rainfall was considerably high in the month of September – Rangpur had 107 per cent and Dinajpur had 75 per cent excess in the rainfall.<sup>129</sup> On 26<sup>th</sup>, 27<sup>th</sup> and 28<sup>th</sup> September rainfall was remarkably heavy in Bogra, Pabna, Rajshahi and Malda, though no flood was reported from any of the places.<sup>130</sup>

The rainfall at Jalpaiguri during the month of August (1902) was above the average and in September, rainfall was excessive (100 per cent. or more than that in excess) which caused a great increase in the water-level of Tista. The flood was restricted to the basin of the Tista river and was the result of overwhelmingly excessive rainfall in the Darjeeling Hills on the 27<sup>th</sup> September.<sup>131</sup> Mr. Forrest, the Deputy Commissioner of the district of Jalpaiguri had provided a useful description of the flood.

“The sudden rise in the flood came as a surprise to everybody in Jalpaiguri...Large pieces of drift wood were being carried along over the road...the water was within a couple of inches of the floor of the strong room [of the treasury]... and had flooded the strong room...[though] no damage was done...the line was breached between Jalpaiguri and Haldibari...some people living in the lower parts of the town were flooded out for a time... Most offices and other public buildings [had] their floors covered with mud but no serious damage was done.”<sup>132</sup>

Thus it can be noticed that though the flood arose to a considerable height but it did not cause any serious harm to the property and crops, so far the Deputy Commissioner’s testimony was concerned. Tista started to flow with a good force but its pace was checked by the railway embankment made for Eastern Bengal State Railway. The flood caused an extensive breach in the embankment and continued to destroy the rice fields to reach to the Ghoramara river. There appeared a number of breaches between the main breach and Mandalghat railway station where a bridge was washed away.<sup>133</sup> Bengal-Duars Railway had also suffered from the breaches that had been created by the flood which caused ‘a large breach [of] 200 feet wide south of Domohani station, rushed down an old *khal* in the direction of Mainaguri.’<sup>134</sup> The southern part of Jalpaiguri was flooded heavily by the Tista.

The flood caused deaths to the indigenous population. The total number of lives lost in the flood was ‘only’ ten including ‘three herdsmen’, ‘three women and two children’ who were belonged from poor families and were exposed to the danger very frequently due to their failure ‘to reach the high bank in time’.<sup>135</sup> Loss of cattle was estimated a great number – 350 head of cattle and 20 buffalos were lost – the Deputy Commissioner reported. There was a large herd of about 500 buffalos on the Nathua Khal when it was submerged in the flood and 79 among them were only rescued.<sup>136</sup> But most surprisingly, it was reported at the same time that ‘little damage was done to the crops’. One would be surprised to think that the flood had taken the cattle and buffalos,

whereas crops remained standing in the field! Parts of Cooch Behar were also affected. The Cooch Behar Narrow Gauge State Railway was reported to have been badly damaged by the flood.<sup>137</sup>

There were also heavy floods in Murshidabad due to the rise of water level in the Ganges in 1904, when the whole of the Lalgola *thana* in the Jangipur subdivision, the Bhagwangola *thana* in the Lalbagh subdivision, and parts of the Sadar and Kandi subdivisions were affected.<sup>138</sup> About fifty villages in the west of the Lalgola *thana* and the whole of the Bhagwangola *thana* were submerged owing to breaches in the embankment, and the water did not subside till after a month.<sup>139</sup> Considerable loss was done to the *aus* and *aman* crops, and grants of money and advances of agricultural loans had to be extended for the relief of the distressed.<sup>140</sup>

‘Severe and extensive floods occurred in the districts of Cooch Behar, Jalpaiguri, Rajshahi, Pabna and Malda in August and September’ of 1906. In Jalpaiguri it appeared in a most severe way. Though the flood of 1902 was limited to the basin of the Tista but in 1906 it spread throughout the district. From the month of July onwards rainfall was considerably increasing in all the parts of the district and near the hills it was excessively high. The main ‘feature of 1906 was the long succession of rainy and sunless days.’<sup>141</sup> The flood commenced when Tista ‘had been rising steadily’ on the night of 3<sup>rd</sup> August and by ‘6 O’clock’ of morning of 4<sup>th</sup> August ‘much of the town was flooded by all the rivers and streams spread across the district had risen at once.’<sup>142</sup> Collection of detail and extensive accounts of the flood, as argued, was hindered by the considerable interruption caused in overall communication system since the flood had destroyed rail lines and roadways in the district.<sup>143</sup>

This time the flood covered a wide range area within its current. At the west of Mal Bazar several bridges were washed away including the bridge over the Kumlai river and a series of breaches were made in the embankment, among which the breach near the Chel river was the widest. Apart from these, the flood brought about heavy destruction in many parts of the district.

“The eastern branch suffered most severely; there was a large breach in the embankment between Mal and Chlasa stations, but the worst damage was done between Chlasa and Nagrakata. North of the railway line the Jaldhaka river divid[ed] into two streams ...between which there [was] a high embankment, which was protected by a rocky islet covered with trees. The flood cut away the island and about, 1,100 feet of the embankment; the Hathinalla bridge stood, but not a yard of embankment remained attached to it,... All the protective

works were swept away and not a vestige of them was to be seen after the floods had subsided. Further east the Daina river cut away 900 feet of embankment, and there were numerous smaller breaches including one rather large one near Madari Hat. It was not until November that this section of the line was open to traffic again.<sup>144</sup>

Though in many parts of the district the telegraph lines were interrupted for some time but there were soon repaired. The considerable disruption of communication affected the movement for people and commodities in a significant way. Nagrakata and the surrounding tea gardens situating at the east of it fell heavily relied on the Ramshai Hat railway station for their purchases of rice and coal and for the means of carry across the tea in the open market. The flow of traffic which was frightened on the Ramshai Hat-Sulkapara and Ramshai Hat- Gairkata roads ‘was in consequence very great and efforts were directed to make these roads passable for traffic to keep them open.’<sup>145</sup> In order to normalize the ferry system increased number of boats was called upon from Burnes Junction and was rapidly stationed on the ferries over Jaldhaka and Daina river.<sup>146</sup> The major damage in the Bengal-Duars Railway caused by flood had contributed to the propping up of the necessity to build upon alternative roadways between Ramshai Hat and the tea gardens between the Jaldhaka and Torsa rivers. In fact, a road was started to construct within the Tondou forest in anticipation of its natural immunity from the occurrence of any flood in future. A protective embankment was proposed to build along the line of Tista in order to protect the town of Jalpaiguri from the floods.<sup>147</sup> Western Duars of Jalpaiguri district was devastated by the 1906 floods. Destruction of crops led to abnormal rise of prices of food grain which reached to the famine prices. This severely affected the poor tea garden workers who looted a tea garden *haat* at Bataigol near Malbazar and a few shops near Chalsa railway station.<sup>148</sup>

In the district of Malda during the post-flood period the price of rice increased to 6 seers per rupee, and as a result relief measures were initiated by the Government through the extension of advance a lakh of rupees under the Agriculturists’ Loans Act.<sup>149</sup> It was due to the fact that the high prices of rice was resulted in sudden increase of demand from East Bengal since the crops were adequate in the *barind* region of the district which was escaped from the flood as being positioned in the high lands.<sup>150</sup> *The Bengalee* had reported that – In Malda

“rice and all the vegetables and other eatables [had] been selling at famine price for these two months and a half and the state of things [had] at last assumed a fearful aspect...the present famine [was] almost unprecedented in the annals of the district of Malda...the *aus* crop ...[had] also been washed away by the persistent and high flood of the last few days.”<sup>151</sup>

Rajshahi was also suffered from the scarcity of food grains. Due to the large scale destruction of *aus* crop situation was further aggravated to the famine condition. The Rajshahi Famine Relief Committee had attempted to relief operations ‘on a moderate scale helping able-bodied men and women with relief works and men of limited resources with cheap rice sold to them at a rate considerably below the market price and with gratuitous distribution of food to those who by long starvation have become unfit for work.’<sup>152</sup> Long lasting starvation took away life of a woman whose two infant daughters suffering from chronic starvation had turned into ‘skeletons’. Since Government funds were not sufficiently helping the distress for their recovery from this situation so ‘kind heated ladies and gentlemen [were] earnestly requested to come to the help of suffering humanity.’<sup>153</sup> Thus it can be noticed that in Rajshahi the post-flood famine had turned into a ‘humanitarian crisis’.

The Princely State of Cooch Behar was visited by a terrible flood in the first week of August 1906. Though the flood had spread to the all parts of the State but it caused maximum damage to the 28 Taluks in the Mathabhanga Sub-division. Roads were damaged throughout the State and due to the ‘destruction of two large bridges and some other breaches on the line from Gitaldah to Cooch Behar, railway communication was suspended for four days from the 5<sup>th</sup> August.’<sup>154</sup> *The Annual Administrative Report for 1906-07* stated about the relief operations conducted in the State, in the following words:

“...the loss to Bitri paddy was about four annas, and the late paddy also suffered. Rs. 1,500 were spent in gratuitous relief to the really needy, and a loan, under the Agricultural Loans Act XII of 1884, of Rs. 6,000 was given to the cultivating Jotedars and Chukanidars who really stood in urgent need in affected Taluks, the maximum amount of the loan not exceeding Rs. 50 in each case.”<sup>155</sup>

The flood had brought out with it conditions for cholera which broke out in the most parts of the tract which had been inundated. In addition to this problem high prices of food grains had added to the sufferings of the people. The Administration of Cooch Behar Maharaja had spent a good amount of grant in the post-flood period for repairing work in several parts of the State. The principal works which had been done were – “i) filling up gaps in the Emigration Road and reconstructing on a separate alignment a bridge over Teesta Char at Mekligunj and repairing a bridge at the 46<sup>th</sup> mile; ii) filling up 3 big gaps and many small ones on the Cooch Behar-

Shitalkhuchi Road; iii) filling up seven gaps on the Kakina Road; iv) filling up one large gap in the Dinhata-Mekligunj Rangpur Road; v) restoring the washed away portions of the Lowkuty Road; and vi) re-constructing wooden bridge on the Patgram, Bhutan, Kashiabari and Mekligunj Roads.”<sup>156</sup> The reconstruction description had underscored the massive damage of roads in several parts of the State where road-communication was severely affected by the floods of 1906. Cooch Behar was again flooded in the month of July 1910 when river Torsa had overflowed its both sides of banks. The flood was resulted in desertion of houses and dwellings by the poor and occurrence of breaches in the railway line between Dinhata and Dewanhatta which disrupted the communication system.<sup>157</sup> Other parts of north Bengal especially Jalpaiguri district and the Duars region had witnessed a considerable amount of rainfall throughout the month of July. Sirajganj was flooded in the month of August as a result of excess in local rainfall coupled with the abnormally high level of Brahmaputra.

The flood which occurred in the month of September of 1915 had inundated a large tract of Duars region and caused noticeable damage to crops and communication of the region. ‘700 feet of embankment at 102½ on the Bengal Dooars railway have been carried away by the Jaldacca river’ – *The Englishman* reported.<sup>158</sup> The river Jaldacca had risen to an abnormal height due excessive local rainfall in the month of August in the district of Jalpaiguri and Darjeeling. Floods occurred in the district of Pabna in September. Floods in this district had created much damage and led to a famine situation. *Amrita Bazar Patrika* had reported that –

“...many houses are under water and the cattle are dying for want of food. Scarcity is prevailing in almost all parts of the district...the whole village of Sthal (Pabna) is under water...the floods are still increasing and it is feared that famine will soon follow...there has been heavy floods in Mathura and Shahzadpur thanas. Several houses in nearly all villages are under water.”<sup>159</sup>

### ***The Flood of 1918***

The district of Rajshahi and Bogra were severely affected by the flood occurred in 1918. The extreme rainfall in the district of Rajshahi coincided with an equally abnormal fall in its neighbouring districts of Dinajpur and Bogra, from where water was draining into the northern parts of the district of Rajshahi.<sup>160</sup> About one-half of the district (about 1,200 square miles) was

affected by the 1918 flood, ‘the height of which varied from 2 to 4 feet above any previously known in the locality.’<sup>161</sup> The flood of 1918 had been characterized as ‘such a flood [which] had not occurred for over a century...’<sup>162</sup> The flood traversed the districts of Rajshahi, Dinajpur, Bogra, and Pabna, ‘causing much damage to crops, homesteads, and cattle over an area of about 1,300 square miles, particularly in the districts of Rajshahi and Bogra.’<sup>163</sup> The Collector of Rajshahi had provided the following account of the 1918 flood –

“... The effect of the August rainfall on the region already saturates with rain was to cause a wide inundation not violently sudden, but steadily extending in a few days over the face of the whole countryside. On the West the waters pushed their way to beyond the fringe the *bils* which run north and south dividing the higher Barind tract from the Atrai. Eastward they penetrated into the borders of Nandigram where the Barind again rises from the wide depression of Singra. Part of the flood water flowed south through the channels and swamps of Bagmara into the Baranoi to region the Atrai lower down; most of it found its way by the main stream of Atrai and the other waterways crossed the railway line into the numerous river channels of Nator subdivision and was carried off through Chalan *Bil* and Pabna to the Brahmaputra.... Nator town had a rainfall of 24.60 inches in August against a normal of 11.35, and of this, 13.21 inches fell in two days, 21<sup>st</sup> and 25<sup>th</sup>. Excessive rainfall in Pabna also... the Brahmaputra and Ganges were in high flood at this time. The flood water of the Padma coming in through the Barals and its channels was added to the Atrai waters and the high level of the Brahmaputra retarded the flow through this district and the district of Pabna.”<sup>164</sup>

The main line of the Eastern Bengal Railway was also affected by the flood of 1918. From 24<sup>th</sup> August the water level began to rise abnormally and it reached its highest point in 30<sup>th</sup> August. ‘Two aged persons and three children were killed by the fall of mud walls and three children were drowned’ – reported by the Collector of Rajshahi.<sup>165</sup> In addition to this, Collector further asserted that more than 7000 houses were severely destroyed and cattle were suffering from want of fodder and shelter since they were standing into the water for days. The *aman* crop was severely damaged and this ‘loss was directly due to the long immersion in the flood water.’<sup>166</sup> In the month of September, the situation had more aggravated. The severity which was reported by *Amrita Bazar Patrika* was as followed:

“Heartrending details of distress occasioned by high flood continue to come from the districts of Rajshahi and Bogra. Naugaon...has suffered most and thousands of people have been rendered homeless... Relief work has been started at Naugaon...a sum of Rs. 50,000 will be

necessary for the relief of the people in the affected area ... Of the 4,000 villages affected by the flood the Committee has been able to extend relief operations to 100 villages only.”<sup>167</sup>

It is important to note here that the relief committee did not succeed to provide relief to all the distress despite of the alleged declaration that the relief was ‘promptly rendered’ through ‘a novel method of...the distribution of seeds by way of loan.’<sup>168</sup> It was assumed that about four lakhs of rupees were distributed in agricultural loans.<sup>169</sup> In spite of all these measures suffering of the people was aggravated to such an extent that people were starving for days or some were ‘being ill-fed with un-boiled rice which sells 5½ seers a rupee.’ The flood water had spread up to a far area in the district of Bogra. In the district of Bogra, it was reported that, 2,000 families were homeless and about 1,000 people were foodless.<sup>170</sup> Apart from Rajshahi and Bogra, the district of Dinajpur was also inundated by the heavy rainfall which started to increase considerably since the last of June. Numerous houses were drowned away and roads were under water when the river Punarbhaba had arisen with high floods and penetrated into the low lying areas of the town.<sup>171</sup>

The Princely State of Cooch Behar had to suffer from the excessive rainfall during the year 1918. From the month of June rainfall was increasingly heavy, in fact the month of June had witnessed the maximum rainfall of the year (45.11 inches), and the rainfall registered at the Sadar Station was 158.37 inches against 114.97 of the previous year.<sup>172</sup> The excessive rainfall caused serious damage to the crops. Bitri crop ‘could not be harvested owing to the heavy rainfall and the out-turn which promised to be a bumper one turned out to be 12 *annas* only.’<sup>173</sup> The *Annual Administration Report* had described the plight of the crops which were affected by the heavy rainfall during the year 1918 –

“For the jute crop the showers of April and May were not helpful... The excessive rainfall in June and July arrested the growth of the plants which did not attain their normal height...jute yielded an out-turn of 8 *annas* only. The price range between Rs. 3 and Rs. 12 per maund. The heavy rainfall recorded in July retarded the transplantation of Haimanti seedlings especially in low-lying lands...”<sup>174</sup>

67 lives had been perished in floods by drowning in different parts of the State.<sup>175</sup> The year 1918 for the Princely State had been characterized as the year of having erratic rainfall. Though the month of June-July had produced excessive rainfall but in the month of August, September, and October there was remarkable shortage of rainfall – 27.14 inches, 8.40 inches and 2.98 inches

only for the August, September and October respectively. The scanty rainfall affected the jute production by prohibiting the steeping and washing necessary for the jute plants. Due to this sort irregular rainfall cholera broke out in all the sub-divisions and excepting Mathabhanga small-pox also raged everywhere. The loss in production of crops had triggered the necessity of importing commodities from the neighbouring areas which was resulted in the abnormal rise of prices of the articles required for ‘necessaries of existence’.

### *The Flood of 1922*

One of the most disastrous floods took place in the Rajshahi Division in 1922 due to the excessive rainfall throughout north Bengal. The rains were brought into the land by a strong depression formed in the Bay of Bengal on 21<sup>st</sup> September which passed through the north and produced exceptional rainfall on the 23<sup>rd</sup>, 24<sup>th</sup>, 25<sup>th</sup> and 26<sup>th</sup> September. The heaviest rainfall had occurred in the Atrai and Punarbhaba Basins.<sup>176</sup> Balurghat, Gangarampur, Gazol, Naogaon, Natore had witnessed abnormal rainfall which constituted the central rainfall areas where ‘almost as much rain fell in one week as during the course of three months in a normal year.’<sup>177</sup> Rai Bahadur Lala Ram, the late Chief Engineer of Eastern Bengal Railway had conducted an investigation and submitted a report on the 8<sup>th</sup> December 1922. The Report stated that –

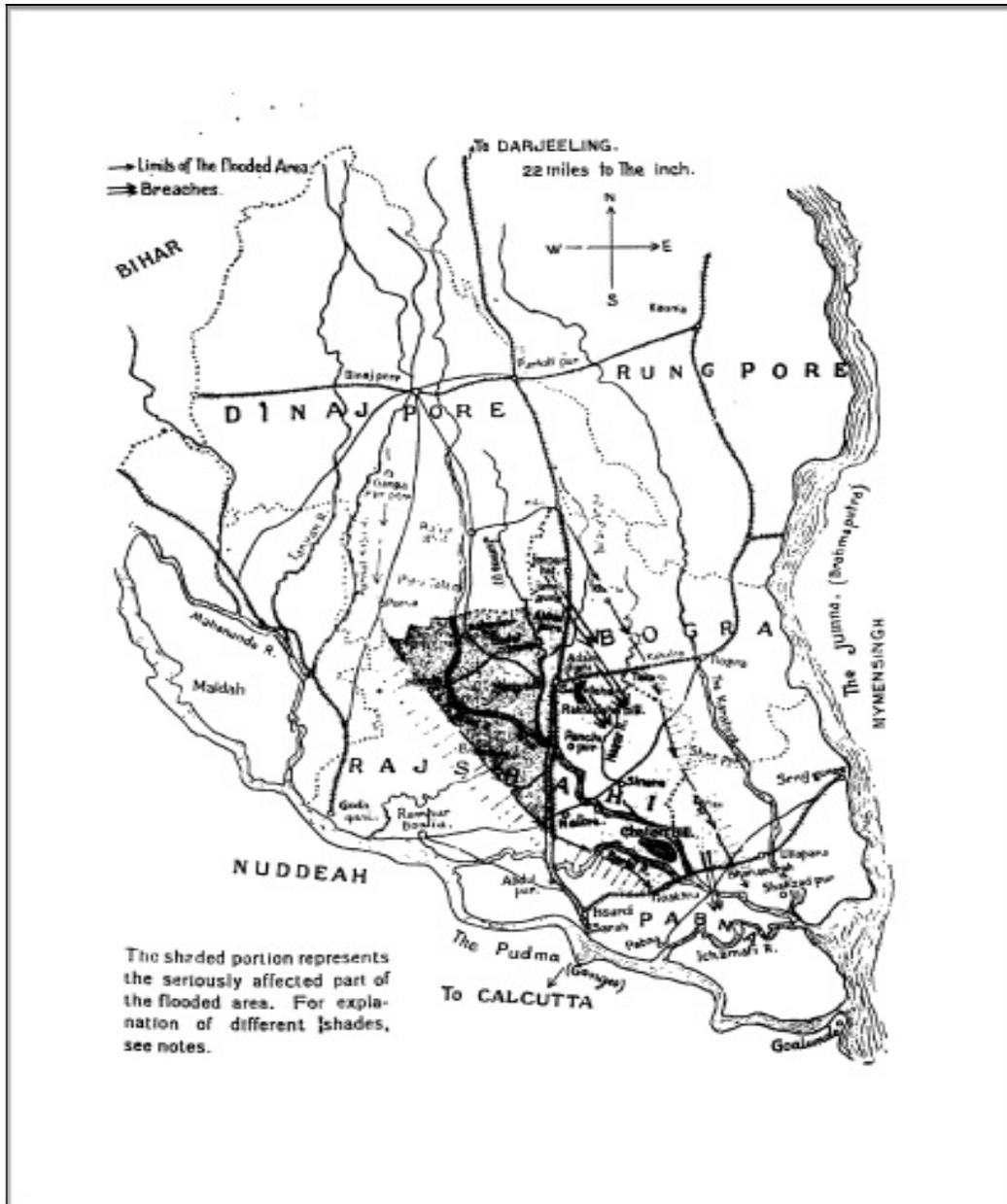
“The rainfall at Dinajpur and in the neighbourhood of Balurghat flooded the Jumuna and Atrai rivers; and this coupled with the local fall at Naogaon and in the north-west corner of Bogra District, which is drained across the main line by the Tulsidanga (a tributary of the Jamuna river) caused an unprecedented flood in the low lying country west of the main line, from a point about 15 miles north-west of Santahar to about 15 miles south of Santahar.... The section ...from Santahar to Bogra...suffered most damage, extensive breaches having formed on both sides of Adamdighi station...”<sup>178</sup>

Lieut. –Col. C. R. Hearn, the then Chief Engineer of Eastern Bengal Railway wrote a note on the above Report where he was of the opinion that the high floods of 1922 were caused by a concentration of three unfavourable circumstances. These were, according him, a) heavy rainfall east of the main line, b) heavy rainfall west of the main line, and c) a relatively high level in the Ganges.<sup>179</sup>

Meghnad Saha, Professor of Physics, Allahabad University, Publicity Officer of the North Bengal Flood Committee had written an article titled *The Great Flood in North Bengal* in the *Modern Review* (vol. 32), November, 1922 ‘for the benefit of the readers of the Modern Review, out of official and non-official communiqués...for a proper understanding of the of the flood and the situation caused thereby.’ Saha had divided the river system of north Bengal on two major groups – The Ganges (or the Padma) on the south and south-west with its tributary the Mahananda; and the Jumna or the Brahmaputra on the east with its tributary the Tista on the north-east.<sup>180</sup> Atrai, another major tributary of the Jumna received waters from numerous small streams of this region and the course Atrai roughly indicates the line of the greatest slope.<sup>181</sup> The flood of 1922 which occurred in the Atrai basin was largely owed to the complexities created by the railway lines spread across the region.<sup>182</sup>

“The rain-water descending from the Balurghat Subdivision swept across the Balurghat-Hilli District Board road, and brushed against the railway line. Up Santahar, this volume of water bifurcated. The upper part broke through the upper section of the line, between Jamal-gunge and Akkelpur at several places, on the night of the 25<sup>th</sup> September...the flood water came at right angles against the Bogra-Santahar line and breached it at several places, east and west of Adamdighi... The only way of escape was through the channel of the Atrai and some other small rivers... [but] very insufficiently provided with culverts, and often times the culverts of the meter gauge line have no corresponding culverts on the parallel broad gauge section.”<sup>183</sup>

The poor or even the absence of minimum drainage had brought considerable misery to the district. In fact, the closing of many small outlets of water held it for long time until it obtained significant height or covered a wide region. Moreover, it was observed that during the time of ‘reconstruction of the new broad gauge line, many openings on the original line were either closed or much shortened in width. As a result, water could not pass easily, the flood got blocked by the railway line.’<sup>184</sup> The flood in Eastern Rajshahi, in the Panchupore Singra area was caused by the flood water which was coming from Bogra through the Raktadaha - Chalan bil line. Water was slowly subsiding from the inundated area due to ‘the obstruction offered by the broad gauge line from Sara to Serajgunj’ which implied that if the Sara-Santahar line did not exist there then the ‘flood water west of this line would have spread into this area, and would have ultimately passed through Pabna to the Jumna thus relieving the pressure west of this line.’<sup>185</sup>



Map. 4. 3: The flooded area along with the breaches and railway lines in 1922 Flood.

Source: Meghnad Saha, 'The Great Flood in North Bengal', *Modern Review*, vol. 32, November, 1922.

The breach in the railway line between Adamdighi and Nasaratpur (Bogra-Santahar) line appeared nearly three quarters of a mile wide which was totally washed out. The families had to take shelter on the top of the roof as the houses were drawn away by the floods.

The official version, however, had differed from the above version. The colonial assertions did not include 'the course of western section of the flood-water which poured into Naogaon and

Nator, and was held up by the double line running from Sara to Santahar, causing a devastating accumulation of water for upwards of a fortnight.’<sup>186</sup> The Official Committee, as had been argued, intentionally overlooked the disastrous impact of the railways and put all the blames upon the ‘freaks of nature’. The flood had brought havoc to the crops in the district of Rajshahi and Bogra where 70 to 75 per cent and 90 per cent crops were damaged respectively. The area affected in the district of Rajshahi was three times the area affected in Bogra and was also greater in terms of the loss of crops and cattle.

The above narratives of the floods in north Bengal has not only underscore the effect of rainfall upon crops and society but has generated a scope for investigating the circumstances which led to the occurrence of floods, other than the excessive rainfall which had hardly been controlled by the means of any human agency. As it is already noticeable in the above description, floods were frequently intensified by the impediments came across the normal flow of water. Thus it is indispensable to examine the issues of embankment and irrigation along with their ecological relationship in colonial north Bengal.

Table. 4.3

## List of Floods in North Bengal, 1870 – 1922

Year	Affected District	Intensity of Flood	Extent of Damage	Remarks
1870 (July and August)	Rajshahi and Pabna	Moderate	Great damage to crops	Overflow of the Ganges. High level of the Brahmaputra
1871 (End of Aug. to 2 <sup>nd</sup> week of Sept.)	Malda and Rajshahi	Severe and extensive	Considerable loss of cattle	Excess rainfall. Exceptionally high level of the Ganges.
1874 (Sept.)	Rajshahi and Pabna	Moderate	Great damage to crops	High level of the Ganges and of the Brahmaputra.
1875 (August)	Malda and Pabna	Moderate and slight	Damage to crops	Local excess of rainfall. High level of the Ganges.
1879 (August)	Rajshahi	Slight	Damage to crops	High level of the Ganges caused by heavy falls in the United Provinces and Bihar.
1885 (Sept.)	Rajshahi, Malda, Dinajpur	Severe	Considerable loss to human lives and cattle and destruction of property.	Heavy local falls. Very high level of the Ganges.
1886 (Sept.)	Bogra, Malda, Rajshahi and Pabna	Moderate	Destruction of houses and property	Excess rainfall. High level of the Ganges and the Brahmaputra..
1890 (August)	Pabna	Moderate	Roads seriously damaged	Overflow of Ganges
1890 (August)	Darjeeling	Slight	Roads seriously damaged	High level of the Tista
1892 (July)	Jalpaiguri, Darjeeling, Rangpur and Dinajpur	Very severe	Considerable loss of human life and destruction of cattle; great damage to roads and property.	Very heavy falls. High level of the Tista, Mahananda, Pharia and Atrai. Serious holding up of water in Dinajpur and Rangpur by the railway line.
1892 (July)	Pabna	Slight	.....	Overflow of the Ganges
1898	Darjeeling	Moderate	Damage to crops	Local rainfall
1899 (Sept.)	Darjeeling	Very severe	Destructive landslips. Considerable loss of	Very heavy rainfall on the 24 <sup>th</sup> and 25 <sup>th</sup>

			human life and unprecedented damage to roads, bridges and buildings.	September.
1902 (August)	Cooch Behar and Rangpur	Slight	.....	Excess of rainfall
1902 (Sept.)	Jalpaiguri	Severe	Ten lives lost, damage to railways, serious loss of cattle.	Heavy falls in the hills. Overflow of the Tista.
1904 (August)	Malda	Slight	.....	Exceptionally high level of the Ganges.
1906 (August and Sept.)	Jalpaiguri, Cooch Behar and Darjeeling	Severe	Extensive damage to crops and property	Heavy rainfall.
1906 (August and Sept.)	Pabna, Rajshahi and Malda	Slight	Famine conditions in Malda and Rajshahi	Abnormal rise of the Brahmaputra.
1910 (July)	Cooch Behar and Jalpaiguri	Moderate	Several breaches in railway lines	Excessive local rainfall.
1910 (July)	Pabna	Slight	.....	Abnormally high level of the Brahmaputra.
1915 (August)	Duars	Slight	Damage to crops	Heavy local rainfall
1915 (first week of Sept.)	Pabna	Slight	Villages under water	A high river level
1918 (End of August)	Rajshahi, Bogra, Dinajpur, Rangpur, Pabna and Malda	Severe	Several deaths and considerable damage to crops and property	Heavy cyclonic rainfall on the 24 <sup>th</sup> , 25 <sup>th</sup> and 26 <sup>th</sup> August
1919 (End of Aug. and 1 <sup>st</sup> week of Sept.)	Pabna	Slight	.....	Overflow from the Ganges.
1922 (Last week of Sept. to middle of Oct.)	Bogra, Rajshahi, Pabna and Dinajpur	Very severe and extensive	Estimated loss of property worth 6 crores	Exceptionally heavy cyclonic precipitation in the week ending 27 <sup>th</sup> September.

Source: P. C. Mahalanobis, *Report on Rainfall and Floods in North Bengal, 1870 – 1922*, pp. 9-

### III.

#### ***Embankment, Drainage and Irrigation in Northern Bengal***

James Rennell in his *Memoir of a Map of Hindustan* had stated the following patterns of inundations in Bengal:

“The inundations in Bengal, differ from those in Egypt in this particular, that the Nile owes its floods entirely to the rain-water that falls in the mountains near its source; but the inundations in Bengal, are as much occasioned by the rain that falls there, as by the waters of the Ganges; and as a proof of it, the lands in general are overflowed to a considerable height, long before the bed of the river is filled. It must be remarked, that the ground adjacent to the river bank, to the extent of some miles, is considerably higher than the rest of the country, and serves to separate the waters of the inundation, from those of the river, until it overflows.”<sup>187</sup>

Recent researches have unfolded that the colonial Surveys on water resources of Bengal for the sake of ‘water management’ and ‘embankment construction’ was followed by a long drawn official engagements of the company officers and surveyors who conducted these surveys since the 1760s.<sup>188</sup> In the northern Bengal there were embankments maintained in three districts—Rajshahi, Malda, and Murshidabad. In the Rajshahi districts there were two small embankments, which were kept up for the protection of Government property when the ordinary embankments were abandoned in 1819-20. In Malda there was only one public embankment, which seemed originally to have been constructed for the protection of the mulberry cultivation and the Government silk trade. Both in Rajshahi and Malda embankments were maintained at the Government expense. The Murshedabad embankments were somewhat under 100 miles in extent, and the annual expenditure on them from 1799 to 1834 averaged Rs. 5,128. In spite, however, of the consensus of opinion on the subject, the Government expenditure continued to increase. On the occasion of the inquiry in 1835-37, the Board reported that numerous embankments were repaired at the Government expense though they had been unable to discover any document binding the State to do so. The Board reported that no liability was attached to the Government, but also they did not consider that any liability attached to the zamindars, and they recommended the abandonment of the bunds, except where necessary to protect stations or cantonments. However, in 1875 it was declared that apart from the earlier expenditure which had already been

paid 'any future expenditure, if incurred by public officers, must be recovered from the zamindars and 'proprietors' benefited.'<sup>189</sup>

From the beginning of the second half of the nineteenth century, embankments and drainage issues attracted a considerable attention of the British administration. Controversies had still remained there regarding the possession, supervision, expenses and maintenance of embankments in Bengal. It was not before 1855, the British Government introduced any systematic effort towards codifying the rules and regulations related to the embankment. Though the Act of 1855 had endeavoured to settle embankment issues but 'as experience proved', the Act was 'insufficient'. It was only in the Bengal Embankment Act of 1873 that all the difficulties, it was said to believe, had been grappled with and a legislative measure passed which would lead to 'a satisfactory solution of the difficulties which had hitherto beset the Government.' While delineating the 'definition' of 'embankments' as a 'separate notice' in the *Embankment Manual* (1875), all the subsidiary works necessary for the maintenance of embankments including inspection bungalows were incorporated in the existing embankment manual, but it hardly resolved the issue - 'whether the side lands from which the engineer used to take earth when they needed it, but which the owners used also to sow with rice or other crops' would be included in the embankment.<sup>190</sup> Zamindars appeared to hold significant place in the embankment discourse since the expenses of construction, alteration, or extension of all works and the cost of maintenance and repairs related to embankment were to be paid by the zamindars of the estates in which might be situate the lands benefited or protected thereby. As the Government in necessity would increase the amount of revenue demandable in respect of any estate in consideration of making provision for the embankment and maintaining the said embankment, the increased amount so demandable would be remitted to the zamindars.<sup>191</sup>

In the last quarter of the nineteenth century considerable interest had been shown on the part of the colonial government to 'acknowledge' the so-called 'obligation towards the agricultural community at large - to afford protection from inundations.' The obligation was generated from the belief that 'the time had passed away when the people were ready to accept a paternal Government as an arbitrator to do justice between individuals and the public at large.'<sup>192</sup> The section 53 of the 1873 Act proposed that

“Every person who, without the previous permission of the Engineer, shall erect, or cause or willfully permit to be erected, any new embankment, or shall obstruct, or divert, ... if such embankment or water course is likely to interfere with, counteract, or impede any public embankment or any public water course, ... shall be liable on conviction to a fine not exceeding five hundred rupees, or, in default of payment, to imprisonment of either description for a period not exceeding six months.”<sup>193</sup>

Thus a clear-cut division in terms of hegemonic possession of embankment had come into vogue which delineated the distinction between ‘State’s embankment’ and ‘public embankment.’ The necessity for defining the ‘liability more precisely’ had turned out to be as the enactment of the laws ‘to the stricter construction which was now put on the restrictions.’ Drawing from several regional instances, In response to this act Indians damaged or cut embankments, acts which were characterized by the railway administration as sabotage. The Act delineated that ‘the perpetrators be charged with criminal action’ for the ‘malicious interference’ with railway property.’<sup>194</sup> Embankment appeared to be a contentious site of colonial domination which again put in the background the division between *we* and *they*. Tirthankar Roy is of the opinion that colonial objective for constructing embankments had a ‘political’ ‘desire to control peasant societies’ and like many other forms of control the embankments were applied as ‘tools of the empire’.<sup>195</sup>

The embankments constructed in the districts of Rajshahi and Malda during the early part of the nineteenth century were meant to protect Government property and to serve the Government’s silk trade. Hardly any attention on the part of the Government had been displayed to protect either the Indians or their interests. The Act of 1873 re-enacted the procedure which empowered the Government to enter upon lands as necessary, and allowed the Government with their desirable ‘maintenance’ of the public embankments through its own Engineer officers. The Act of VI of 1873 had been placed for necessary amendments in 1882 before the Council. As a counterpart of the punishment imposed upon the Indians, the 1882 Amendment of the 1873 Act had proposed that any damage caused to the inhabitants by any work which was done under the Act, compensation was to be made to him.<sup>196</sup> However, the clauses and provisions for the compensation allowed to the victims were too complex to understand and in the official circles there was persisting ambiguities even in the last quarter of the nineteenth century regarding the scope and method of compensation. Mentioning the Act XXXII of 1855 it was stated in the *Embankment Manual of 1875*, that:

“Act XXXII of 1855 prescribed that in fixing their award the arbitrators were to allow for any benefit which the claimant derived from the work as a set-off against the injury for which he claimed compensation. It is not equally clear whether the Judge and Assessors should allow for this under Section 33. If the claimant proves a certain damage in one way, and consequent diminution in value, it seems open to question whether the court is bound to allow, as a set-off, advantages derived by him in another way. Perhaps it may be intended that such advantages or benefits should be considered by the Collector when apportioning the cost, and if provable, be then assessed, leaving it to the compensation court to look to the injury only. Still this would often be very inadequate, and in all cases inconvenient, as a claim for compensation is the very time when these advantages would most probably come to light, and then it would be too late.”<sup>197</sup>

Not only the human, but cattle had also been drawn under the *Manual* which proposed if “any person who shall cause, or knowingly and willfully permit, any cattle to graze on any public embankment, or shall tether or cause or willfully permit any cattle to be tethered upon such embankment,” was liable to a maximum punishment of six months' imprisonment or Rs. 200 fine.<sup>198</sup> Despite the Lieutenant Governor's sympathy for ‘every old woman who permitted a goat to graze upon an embankment’ the Legislative Council, by passing this section, had shown their conviction to the, what they had already identified, as ‘very common offence of the villagers tying their cattle to graze upon embankments by hundreds.’<sup>199</sup>

Railway embankments in northern Bengal frequently acted as obstructions to the natural drainage of the water and thus contributed to the lengthening of the duration of floods. Radhakamal Mukerjee had argued that the increasing expansion of railways in northern Bengal had ‘obstructed drainage and recurrent floods being inevitable results, especially in the south-east of this region.’<sup>200</sup> Though ‘a full examination’ of the river channels for building railway embankments in north of the Ganges had been proposed in 1870s but the idea hardly had any substantial capacity to counter the necessity of providing ‘a sufficient outlet for the teeming population, and for the products of those fertile districts’.<sup>201</sup> In 1872 the Government of India instructed to the Government of Bengal that

“...the best that can be chosen for a trunk line through Rajshahye, Bograh, Dinagepore, and Rungpore. This line starts from the vicinity of Dhaparee on the River Ganges, and proceeds, through Nattore, Hillee, and Tengamaree, to Julpigoree. Such a railway passing through the heart of a rich country will not only be extremely valuable in itself, but will be situated so that branches may be readily constructed to Rungpore, Bograh, Dinagepore, and other centres of trade both to the east and west of the railway. A second,... aim has been to give access to

the hill station of Darjeeling, the tea plantations, and to the Darjeeling Terai ... [for] giving a better approach to the tea districts than a road through Titalya or Silligoree...The line from Hillee to Tengamaree is to be surveyed; and if His Honor has no desire that the railway shall pass absolutely through Tengamaree, a route slightly to the westward may be aligned nearer to the river Kurto, as the upper portion of the Atrai is called...a section taken for a railway from some suitable point between Hillee and Tengamaree to Rungpore and cross the Teesta and Dhurla rivers, on to Doobree and thence to Goalpara, assuming that the minor rivers shall be bridged, but that the Berhampooter will be crossed by means of a ferry.”<sup>202</sup>

Thus it can be observed that commercial interests for the colonial government had become the first priority in constructing railways in northern Bengal. Little concern on the part of the Bengal Government had been displayed while bridging the minor rivers, but this could only be seen in the case of large rivers like Ganges, Tista and Brahmaputra which involved improvised technologies and investment of huge money. Otherwise the Government did care very little about the consequences of railway lines and embankments in the close proximity of rivers. What motivated them to expand railway lines in northern Bengal was nothing but their ever increasing interest in the lucrative trade of valuable commodities of northern Bengal. The construction of railway line nearer to the rivers, no doubt, had produced floods by holding up water for a long time or by obstructing the outflow of water from the inundated area.

The enquiry regarding the 1892 flood in Dinajpur had concluded that the railway line, which divided the district from east to west, was responsible for the damage by holding up the flood water coming from the north.<sup>203</sup> Though embankments which were constructed to protect flood was of very rare but sometime this was perceived that “as such works generally effect[ed] more mischief than they obviate[ed] because they prevent[ed] the river water reaching land where it [might] be essential that it should go, and when an emergency [did] occur, they generally [gave] way to the flood, and render[ed] the violence of the pent-up water ten times more destructive than it would have been....”<sup>204</sup> Embankments in 1870 at Lalitakuri of Murshidabad on the rivers Bhagirathi caused serious floods during the subsequent years which swept across the district into Nadia and furthermore, and these embankments accelerated the rise of water level to a maximum height which flooded the district in 1885 and 1890.<sup>205</sup> Ritika Prasad in her seminal research addresses the fallouts of construction of railway embankments which aggravated the unseasonable or excessive floods through blocking drainage and damaging crops.

The Eastern Bengal Railway had caused the circumstances which could create severe floods by blocking the passages for natural drainage of water. The construction of north-western division of the Eastern Bengal Railway (EBR) had resulted in the worsening of the water regime of northern Bengal as it interfered into the existed pattern of the Chalan bil.<sup>206</sup> The railway expansion in the district of Rajshahi and Pabna had increasingly engulfed the surrounding areas of the bil and in the beginning of the twentieth century it can be noticed that the bil was encircled by the EBR main line to the west and the Santahar - Bogra line in the north. The passage of water from the bil had to encounter the obstacles created by the Bogra - Santahar branch line and the EBR main line and the Sara Sirajgunj branch line.<sup>207</sup> Moreover, the further construction of a broad gauge line between Atrai and Santahar had deteriorated the condition by reducing the number of spans on the bridges in the second decade of the twentieth century when between 'Atrai and Santahar, the total existing water way [was] reported to be 440 feet as compared with 967 when the line was first made.'<sup>208</sup> The frequent flooding of the Chalan bil area prohibited the 'cultivators of the vast area to the north-west of the Sara-Sirajgunj line ...the cultivation of rabi (winter) crops as the fields did not dry up in time for cultivation.'<sup>209</sup>

Larger bridges stood as a great source of mischief to the water system of the region. The great Goalundo spur which was constructed in the 1920s at a cost of £120,000, did not turn out to be profitable for the region. The Hardinge Bridge over the Padma at Sara seemed to be an ideal example of the problems created by the railway bridges. The Hardinge Bridge was opened on 4<sup>th</sup> March, 1915. The construction of a railway bridge over the Padma was proposed in 1889 by the Eastern Bengal Railway for easier communication between Calcutta and the Eastern Bengal and Assam. The Report prepared by Sir F. J. E. Spring recommended for the construction of a bridge at Sara-Sirajgunj line. The most stupendous task in constructing the bridge was to prevent bank erosion and to hold the continuation of the river flow under the bridge.<sup>210</sup> Lands surrounding the bridge had to suffer a lot during and after the years of construction which caused a complete upset in the Ganges below and above' and the coming years had witnessed some devastating floods in the neighbourhood of the bridge.<sup>211</sup> The 1922 flood, as argued by some scholars, was the creation of the notorious impact of the railway expansion in north Bengal and railways has been characterized as the 'Frankenstein's Monster' which trapped the water for long time until the flood occurred.<sup>212</sup>

Drainage system which controlled a greater degree of occurrence of floods was insufficient over the greater part of north Bengal and was abnormally vulnerable to even very minimum changes of water level. The ground level of the central area of the rivers had continuously risen by the deposit of silt and the river channels in the interior areas of the districts were more and more deteriorating.<sup>213</sup> Though in the late nineteenth century health issues became a matter of concern in the realm of drainage pattern but it did not acquire sufficient attention that it demanded and health only remained 'one of the grounds specified as justifying interference with drainage.'<sup>214</sup> Though drainage seemed to appear important in the embankment discourse but the ideas dominating the official circle put extraordinary emphasis on the embankments since it believed that "the Egyptian agriculturists could hardly have made a greater mistake had they dammed out the inundation of the Nile than was made by the people of Rajshahye and Jessore in constructing and keeping up the embankments which formerly existed in those districts."<sup>215</sup> The Collector of the district of Rajshahi was of the opinion that –

“The drainage of Rajshahi can best be represented by supposing the District to be the segment of a somewhat irregular circle, of which the Ganges river forms the limb and the Chalan *bil* the centre. The lines of drainage would then be represented by a series of concentric lines running from the Ganges, and from the high country in Dinajpur to the north, towards the southern extremity of the Chalan *bil*. The Ganges bank being higher than the general level of the country, the water drains away from it. The drainage from all parts of the District converges in the Chalan *bil* from whence it flows away castward.”<sup>216</sup>

Forest reclamation or de-forestation for agricultural extension on a large scale had cleared a vast area surrounding the river banks in the district of Jalpaiguri and Western Duars. Colonial lust for maximum revenue generation through the expansion of agricultural settlement and tea gardens coupled with looting of precious timber resources unleashed an unrestrained reclamation of forest tracts in the district throughout the nineteenth century. Though the later implementation of 'scientific forestry' had to some extent endeavoured to mitigate the disastrous effect of de-forestation but the effort fell too short to cope with the problem. In fact, in the early twentieth century the Government had to admit that –

“A great mistake has been made in the past in not leaving a strip of jungle along the banks of all such water courses, for this has proved itself to be the only natural means of exercising any real control over their movements. Not only have the banks in too many cases has been cleared for cultivation, but no effective check has been possible over the cutting of irrigation

channels, locally known as jampoos, and other forms of activity in the beds of rivers. The result has been that huge areas have been ruined by the rivers changing their courses and such changes in very many cases are directly traceable to a jampoi...much land in the Duars will go out of cultivation if irrigation is entirely prohibited and much damage will be caused to tea gardens, jote lands, railways, roads and forest if river training is entirely vetoed...’’<sup>217</sup>

Therefore, the solution had been ‘scientifically placed’ by proposing erection of sluice gate and ‘protective works’ for tapping mountain torrents. Moreover, river training appeared to be the most ‘necessary’ step for all the rivers - be it large or small.<sup>218</sup> Having a closer look at the ideology of river training, one may come across to the fact that this had been undertaken for the protection of Governmental properties and European settlement along with their capital and trade. The Bengal Duars Railway, Jalpaiguri Cantonment, tea gardens, Alipur Duar Civil Station for which the river training was proposed all were the sites of imperial control and European profits, nothing was meant to serve the indigenous purpose. The clearing of forests and planting of tea which had altered the entire ecology of the district within a very short span of time had reinforced the ‘question of the obligation of the men below to accept and dispose of the drainage water of the men above and the liability of the men above in converse cases.’<sup>219</sup> The sloppy nature of the district allowed the water to rush through the lower parts or to the plains of the district. Clearances of upper forest tracts for suitable tea garden land had resulted in a great disaster during the time of flood since the powerful torrent did not receive any resistance from any natural force. To protect the river channels from any ‘unauthorised’ interference, Deputy Commissioner was empowered which was, however, was not the complete solution of the problem because the Deputy Commissioner was depended upon the Executive and District Engineers who were devoid of any necessary local knowledge. The floods which ravaged a large tract of the district of Jalpaiguri and Duars in the early decades of the twentieth century had proved the governmental inefficiency and failure of the above measures.

Irrigation was not common in Cooch Behar. Wells were made either by sinking baked earthen rings, about two feet in diameter, in the earth on the top of one another, or else the wells were protected by a square framework of *saal* timber.<sup>220</sup> Sometimes wells were constructed by digging a mere hole in the ground, without any protection to the sides. There was no embankment in the State in the closing years of the nineteenth century. The Deputy Commissioner was of the opinion that since the rivers which were flowing through the State was ‘large’ so it would be

impossible to embank the rivers ‘both on account of the great expense, and their liability to change their courses.’<sup>221</sup>

Till the end of the nineteenth century ‘the rivers and marshes [had] nowhere been embanked with the object of extending cultivation.’ Though there were, however, ‘a countless number of old embankments’ in the surrounding areas of old ruins of Gour, but these were constructed with the object of protecting the city from the inundations of the Mahananda.<sup>222</sup> The numerous marshes or bils which were found in the district were the result of the inundations of the Mahananda and its tributaries. District of Malda had inherited ‘a large number of tanks’ which were scattered all over the *Barind* tract of the district. It was said to believe that these tanks were signs of the existence of an irrigation system during ‘an earlier civilization’ and in the colonial days there were proved to be helpful for the *aman* crop and paddy land during the season of deficient rainfall. There were two methods of irrigation which were locally known as ‘sechan’ and ‘melan’. *Sechan* consisted of raising water when the land to be irrigated was on a higher level than the water of the tank; whereas *melan* was the reverse case, when the level of water was higher than that of the land to be irrigated.<sup>223</sup> The general custom for the peasants of the district regarding irrigating their field was to take water each year from the same tank, over the same fields of their neighbours to their own land; but the custom had not been crystalized to the same extent as in districts like Burdwan. On the other hand a less elaborate and informal system was devised for recording irrigation rights. It was noticed that the river-banks or sometime even the banks of the tanks were inhabited by the people drove to settle there to meet the revenue pressure imposed by the zamindars which resulted in the flattening out of the banks. Moreover, the settlement of *jalkar* rights in tanks was another misguided policy which created disputes among the tenants which was nothing but an encroachment on the irrigation right of easement. Though Mr. Adams-Williams had provided a solution in form of a development of an irrigation scheme for the Barind, by using the Mahananda as the source of water supply, and running pipe lines from centres located along the river bank, but it was not materialized as being ‘extremely expensive.’<sup>224</sup> Landlords and tenants of Malda were accused of being reluctant to execute any contribution towards the Collector who ‘prepared’ ‘scheme after scheme’ under the Agricultural and Sanitary Improvement Act (Act VI of 1920), some of which were of great practical value, but had to be abandoned because ‘Government was expected, as usual, to provide the entire sum

required, and the method of recovery from the tenants benefited, was conveniently shelved.<sup>225</sup> But in the earlier discourse it was already admitted in the end of the nineteenth century that ‘to embank all the Mahananda river system would be a task entirely beyond the powers of the local *zamindars*; nor does the Collector think that it could be any means be turned into a profitable enterprise.<sup>226</sup>

However, few private embankments existed in Malda for the necessity of a regular water supply. There were two embankments of adequate size - one was in the mauzas between Kotalpur and Adampur which was one-third of a mile in length and served the dual purpose of storing water in winter and summer and keeping out flood water during the rains; and another was in the mauzas between Khochakandar and Gopalnagar which was about a quarter of a mile in length and worked as reservoir from which water was taken for irrigation. There were also two large embankments in the district – one was near the boundary between Dolachhola and Patharmandal, and another was near the boundary between Saidpur and Pathar Amarpur. Both of these embankments had served the irrigation purpose and belonged to the Habibpur *thana*. There were two large embankments in Jalkar Bithan and in Koar, which regulated the water supply to the main *boro*-growing area in the Malda thana covering an area of about 2,500 acres.<sup>227</sup> The annual cost of maintenance of these embankments was between Rs. 200 and Rs. 300 which was released from the tenants by the *patnidar*. Thus it is evident from the facts that hardly any intervention had been conducted by the colonial government which could be regarded as its own; since the irrigation tanks and embankments were either early construction or maintained by the landlords or *patnidars*. So far the minimum investment required from the governmental part, were either designated as ‘expensive’ or ‘abandoned’, because of without receiving any indigenous ‘contribution.

In the district of Murshidabad irrigation was conducted either from tanks, or by leading the water from the natural channels. Irrigation-wells and canals were not known to the district even in the closing years of the nineteenth century.<sup>228</sup> Irrigation system in the district of Murshidabad was consisted of disputed property rights centering on the question of how much water one could procure from the tanks. In order to expand the irrigational facilities among the people of the district five steps were suggested, these were – re-excavation of older tanks, excavation of new tanks, utilization of the existing natural channels known as *kandars*, storage and effective

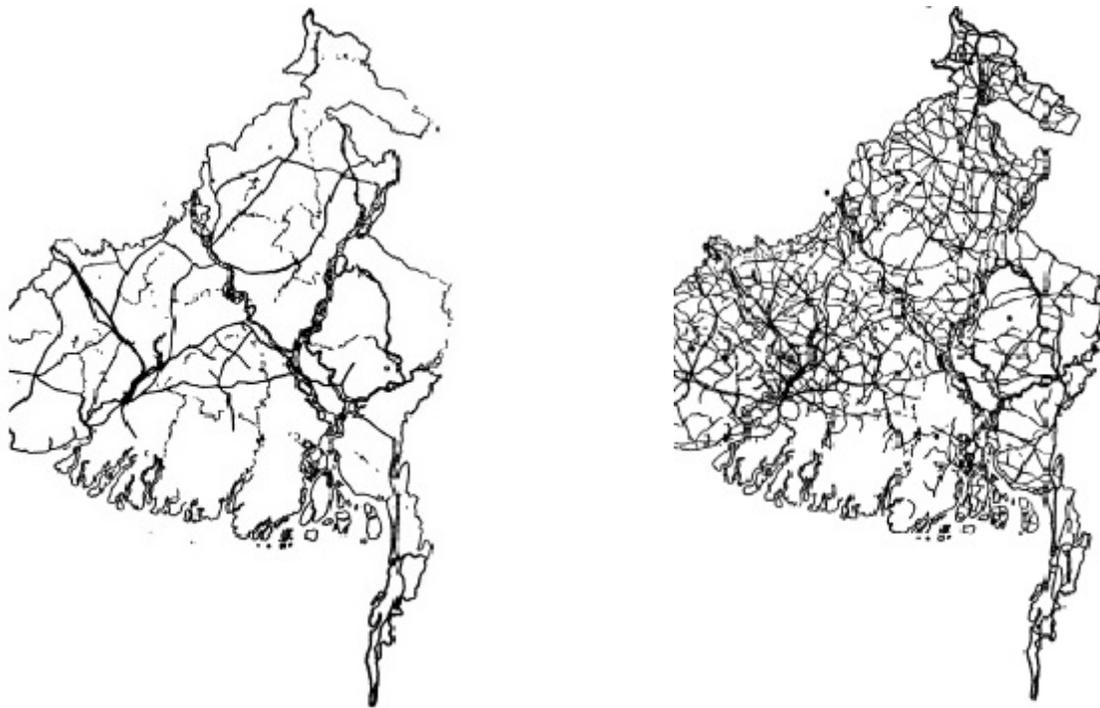
canalization of river water at the time of its maximum flow, and construction of wells.<sup>229</sup> The 1870 flood had foregrounded the necessity of strengthening the existed embankments especially those protecting the populous city Murshidabad, and proposed construction of large number of embankments to be constructed for the future menace of the floods. The most important protective work in the district constructed in the late 1870s was a line of disconnected embankments along the left bank of the Bhagirathi, which was extended from Plassey bazar to Dadmuti – a distance altogether of about ninety-three miles.<sup>230</sup> Though Government had been paying from the *Pulbandi* allowance under section 44 of the Bengal Act II of 1882 to the zamindars, but the zaminadars had been criticized for their serious neglect in ‘maintaining’ the embankments properly.<sup>231</sup> The later developments demonstrated that the Public Works Departments should be allowed to administer the *Pulbandi* allowance and maintain the embankments by mutual arrangements with the zamindars. But there was some exceptions regarding the position of the zamindars. In North Bihar zamindars did not appear as a weak candidate to adhere all the terms and conditions imposed upon them by the colonial State. Infact, big zamindars like Darbhanga Raj was strong enough to fight for shaping ‘the direction and pace of flood control in the region.’<sup>232</sup> Tirthankar Roy shows that in Northern India, embankment construction was mostly a state responsibility and the colonial State had initiated programmes to this end because embankments on the river bank would provide necessary water for irrigation which would subsequently help to expand cultivable land.<sup>233</sup> Embankments, however, would be a permanent solution for a river with non-erodible boundary and carrying no silt but carrying of silt either from its catchment basin or from its erodible boundary on the way created problem for lasting of embankments. Confinement of the flood within the narrow river channel as a result of construction of embankments hampered the natural activity of silt, which through its flow used to create fertile lands, but on the contrary it was deposited into the river bed that caused higher flood level. S. C. Majumdar, the Superintendent Engineer of Irrigation Branch, pointed out that these sorts of developments had let to the deterioration of the river channels which would be continued to deteriorate up to such an extent that could not be protected by earthen embankments.<sup>234</sup>

## IV

### ***Rainfall, Rivers and Contagion: Disease and Epidemics in North Bengal***

S. C. Majumder was of the opinion that before 1787 northern Bengal was healthy and prosperous due to the existence of large number of spill and drainage channels which had intersected this region in a beneficent way. But after the diversion of Tista in 1787, ‘completely cutting off the head-water supply laden with fertilizing silt from the Himalayas’, these channels had gradually deteriorated caused by water-logging which was resulted in ‘inadequate drainage and progressive deterioration of the country as regards health and productivity of the soil’.<sup>235</sup> Since the latter half of the eighteenth century river problems in terms of inundation, silting, drainage problems and blocking had led to the occurrences of diseases which sometime took epidemic shape. The colonial inefficiency to deal with the diseases through providing enough and successful outlet for the flood water or maintaining balance supply of water during scanty rainfall had been proved to be detrimental to public health. The epidemiological construction of disease like – malaria, cholera, small-pox etc. has revealed an integral connection and mutual interdependency between the multitude of social, economic, and biological factors and in this way epidemiology also incorporates certain issues of famines that took place in colonial India. However, recently scholars have interrogated this much discussed issue more critically which involves the investigation on specific entomological and social conditions shaped and nurtured by climate, hunger, monsoon rainfall, and demographic fluctuation.<sup>236</sup> However, malarial occurrences had been attributed to the ‘modernization’ process. Sheldon Watts and Ira Klein have underscored the integral relationship which existed between the spread of malaria and the rapid commercialization of agriculture, extension of the railways, construction of embankments deforestation, and development of urban centres.<sup>237</sup> In these researches, rainfall has not been regarded as important factor for the malarial visitations. Rainfall and inundations had a great influence upon the occurrence of malaria – heavy rainfall and widespread inundations of the land surface generally had checked the widespread breeding of anopheles mosquitoes, whereas short rainfall and scanty inundations favoured their increase. But sometime flooding of the rivers and their surrounding tracts had produced conditions for malaria by blocking the flood water which

was ripe for malarial germinations. According to some estimate the prevalence of malarial fever was three times greater in Northern Bengal (23.7%), four times more prevalent in Central Bengal (32.3%) and five times greater in Western Bengal (40.9%) than in Eastern Bengal (7.5).<sup>238</sup> The remarkable lessened occurrence of malaria in Eastern Bengal had been attributed to better health provided by the expansion of agriculture and good pattern of land use which was prevailed in this part of country. However, the central part of northern Bengal was also rich in agricultural production because of the fact that this part had been inundated every year by the spill waters of the big rivers, which besides providing an ample supply of moisture for the purposes of cultivation, bring with them a rich supply of silt which was deposited upon the surface of the country. Northern Bengal contained portions of the Gangetic and the Brahmaputra deltas, together with the delta of the Tista, the lower portions of which had been appropriated by the Ganges and the Brahmaputra.<sup>239</sup>



Map. 4.4

a. Roads and Railways in Bengal in 1870.

b. Roads and Railways in Bengal in 1920.

Source: C. A. Bentley, *Malaria and Agriculture in Bengal*, p. 28 (a.) and p. 29 (b.)

The above maps have shown the relative expansion of roadways and railways between 1870 and 1920, the increasing development of communication through these two means had considerable impact upon the occurrence of malarial fever. Central Bengal and Northern Bengal possessed a greater mileage of unmetalled road than the Western and Eastern Bengal. Northern Bengal had 314 miles of railways and roads per 1000 square miles of area, whereas for Western, Central and Eastern Bengal it was 308, 349 and 163 respectively.<sup>240</sup> The increasing expansion of roads and railways had contributed to the blocking of water at the time of inundations which resulted in confinement of water in a certain place which seemed to be conducive to the anopheles germination. C. A. Bentley had put much emphasis on the relation between railways and agriculture while determining the causes of malaria. However, a great deal of weightage had been provided to the railways embankments which, it was said to believe, acted as catalyst to the formation and spread of malarial conditions in colonial Bengal. The construction and expansion of Northern Bengal and North-Western Bengal Railways contributed to the outbreak of malaria. Furthermore, fever became intensely prevalent from 1896 onwards in Naogaon during the construction of the Assam-Bengal Railway from Guauhati to Lamding. Malarial visitations had been recorded in the case of embankments connected with the Sara Bridge and in the case of Sara-Sirajganj Railway.<sup>241</sup>

Table. 4.4

Fever indices and malarial vulnerability of Northern Bengal

Fever Indices	Rajshahi	Dinajpur	Jalpaiguri	Darjeeling	Rangpur	Bogra	Pabna	Malda
1920	297.7	38.4	38.1	20.2	28.0	42.0	37.8	42.4
1912	28.6	33.1	21.2	23.0	17.1	16.6	23.0	30.4
Mean	29.2	35.8	29.7	21.6	22.6	29.3	30.4	40.9
Intensely malarious (%)	0.0	15.0	27.2	9.0	7.5	16.6	14.2	23.5
Malarious	77.7	82.6	63.6	54.5	52.5	77.7	71.4	76.4
Slightly mlarious	23.2	4.3	9	36.3	40.0	5.5	14.2	0.0

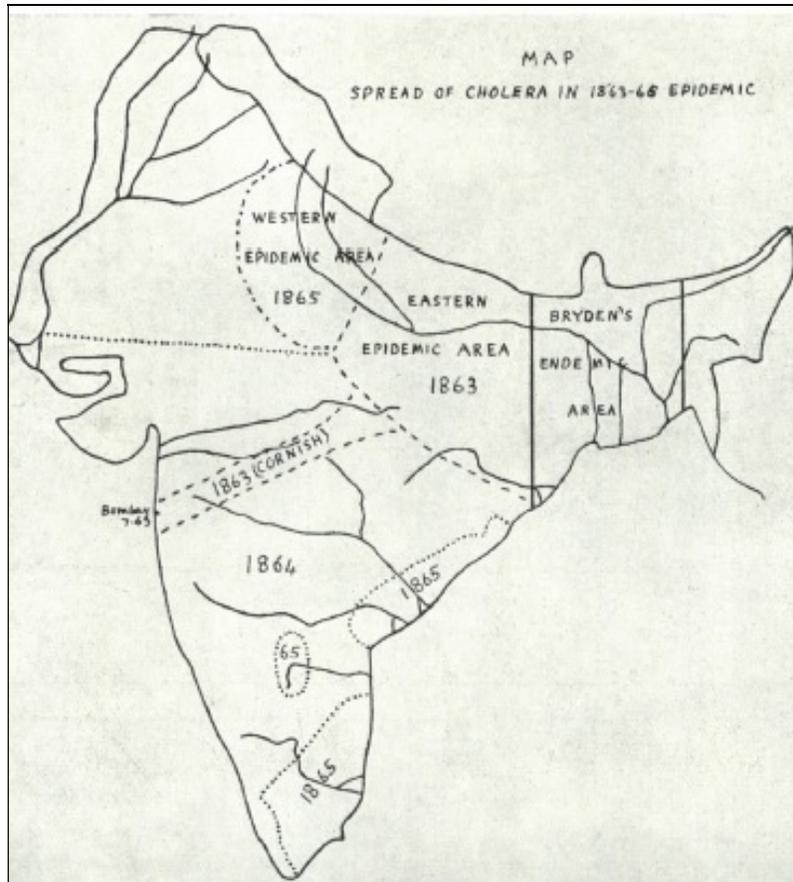
Source: Extracted from C. A. Bentley, *Malaria and Agriculture in Bengal*, pp. xxiv – xxv.

Examining the estimated normal rate of growth of population since 1872, Rajshahi, Pabna, Rangpur and Dinajpur seemed to have suffered severe checks of normal expansion. In 1920 Malda, Dinajpur, Bogra, Jalpaiguri and Pabna were the most fever-affected districts whereas eight years earlier Bogra was relatively less malarious and Malda, Dinajpur and Rajshahi were ahead in this respect.<sup>242</sup> The main fever death-rates of the decade 1911-1920 demonstrated that the districts of Dinajpur, Malda, Rajshahi, Pabna and Jalpaiguri were less healthier than the other districts of northern Bengal.<sup>243</sup> Thus de-population was closely associated with the advent of malaria in the affected tracts which was influenced by 'some definite change in the climate or other ecological conditions.'<sup>244</sup>

During the early part of the nineteenth century there was a widespread belief that Jessore district was the centre of cholera from where the disease spread other parts of Bengal in 1817 and from Bengal cholera traversed the upper part of India. The search for climatic and environmental explanations of cholera began in the latter half of the nineteenth century in Bengal and other regions of the Indian subcontinent. Cholera provoked the outcome of a distinctive genre of writings on several theories which prevailed at that time – blood poisoning theory of Dr. Johnson, Drinking water theory of Dr. Bayer and J. Snow, Fungus theory of Dr. Bud and others, damp-subsoil theory of Professor Pattenkofer, Dr. Bryden's theory, Dr. Pacini's theory, the vibrionic theory of Dr. Macnamara, bacillus theory of Dr. Koch and others.<sup>245</sup> Dividing on a broader category, during this time onwards, a very potent debate had been arising centering on the issue of not only the climatological aspects of cholera but also the case of human intervention in aggravating the disease in Bengal. The debate on the whole bring into the focus the conflict of two distinctive set of ideas between the localists and contagionists - 'localists', who emphasized geography and environment, and the 'contagionists', who instead invoked man and sanitary conditions for the propagation of infection.<sup>246</sup> There was a strong believe that cholera was often 'manifested in extreme virulence, along the bases of natural barriers to its advance, and in the river basins and ravines that lie in between great mountains.'<sup>247</sup> However, the main issue of the debate included the aspects of monsoon influence upon the appearance of cholera. Mr. Cornish who had been preparing a report for cholera in Southern India, had summarily rejected Dr. Bryden's view which emphasized the monsoon dimension of the problem instead of any human causes of cholera. Mr. Cornish had stated that:

“There is a movement of cholera independent of strength or direction of winds... There has been no relation shown as yet between the velocity of movement of cholera and of monsoon winds. It is abundantly clear that the development of cholera in a province (? invasion of a province), has no sort of relation to the rapidity of movement of the air. The theory, that the cholera miasm is in its nature wholly independent of man, is without any trustworthy evidence in its favor.”<sup>248</sup>

On the other hand, Dr. Bryden again responded that cholera was, a ‘air-borne’ disease which had ‘no relation to the routes traversed by man’, and it demonstrated ‘the grand truth that man play[ed] no part in the vast leaps characteristic of all epidemic movements of cholera in India.’<sup>249</sup> Another contemporary work (1884), however, had reinforced ‘an undoubted relation between the meteorology of a place and its liability to cholera activity.’<sup>250</sup> Rainfall, however, had always been a serious factor for cholera epidemic which was aggravated by floods and droughts that produced the condition for the survival of bacteria ‘through the effect of salinity (pH) or nutrient concentrations, as well as human exposure to the pathogen, sanitary conditions and susceptibility to disease.’<sup>251</sup> Although hot dry conditions were unfavorable to the survival of the generally water-borne cholera bacillus, dearth and drought drove villagers to frequent wells, tanks and stagnant pools, which quickly became contaminated with cholera.<sup>252</sup> The colonial investigation traced out the spread of cholera from Bengal to the rest of India through several phases and durations.



Map. 4.5: Spread of Cholera in 1863-65 Epidemic

Source: Leonard Rogers, *The Forecasting and Control of Cholera Epidemics in India*, 1927, p. 324.

Leonard Rogers had summarized Bryden's description regarding spread of cholera from Bengal to the other parts of Bengal in the following manner:

“Bryden included in his Bengal endemic area, from which all cholera spread over India, Western Assam, all Lower Bengal, Orissa and Eastern Bihar, from which the disease spread in the first year of an epidemic over his Eastern epidemic area extending north-west as far as Agra, and travelled in the second year into the Punjab, this route constituting his Northern epidemic highway ; or it might spread to the Central Provinces in the first year, and in the second to Sind and Gujarat by his Southern epidemic highway as it did in 1863 and 1864, also infecting Bombay and most of Madras in the latter year as shown by Cornish ; and in 1865 both the Punjab and the remaining south-east parts of Madras were overrun, thus completing the spread, an epidemic usually lasting four years before dying down again completely.”<sup>253</sup>

Bryden pointed out that the expansion of cholera from Bengal over Northern India could not be explained as a spread through human intercourse, as the disease first increased in the sub-Himalayan divisions of the United Provinces where there was no railway at that time, and only became epidemic in the Punjab in June with the onset of monsoon.<sup>254</sup> In 1871-72, Bengal was overwhelmingly affected by cholera, and Rajshahi Division placed in the top of the list in terms of deaths occurred during the period.

Table. 4.5

Deaths from cholera in 1871 in Rajshahi Division

District	Deaths occurred	Per 1000 (%)
Rajshahi	1,546	1.17
Murshidabad	669	.49
Malda	603	.88
Bogra	356	.51

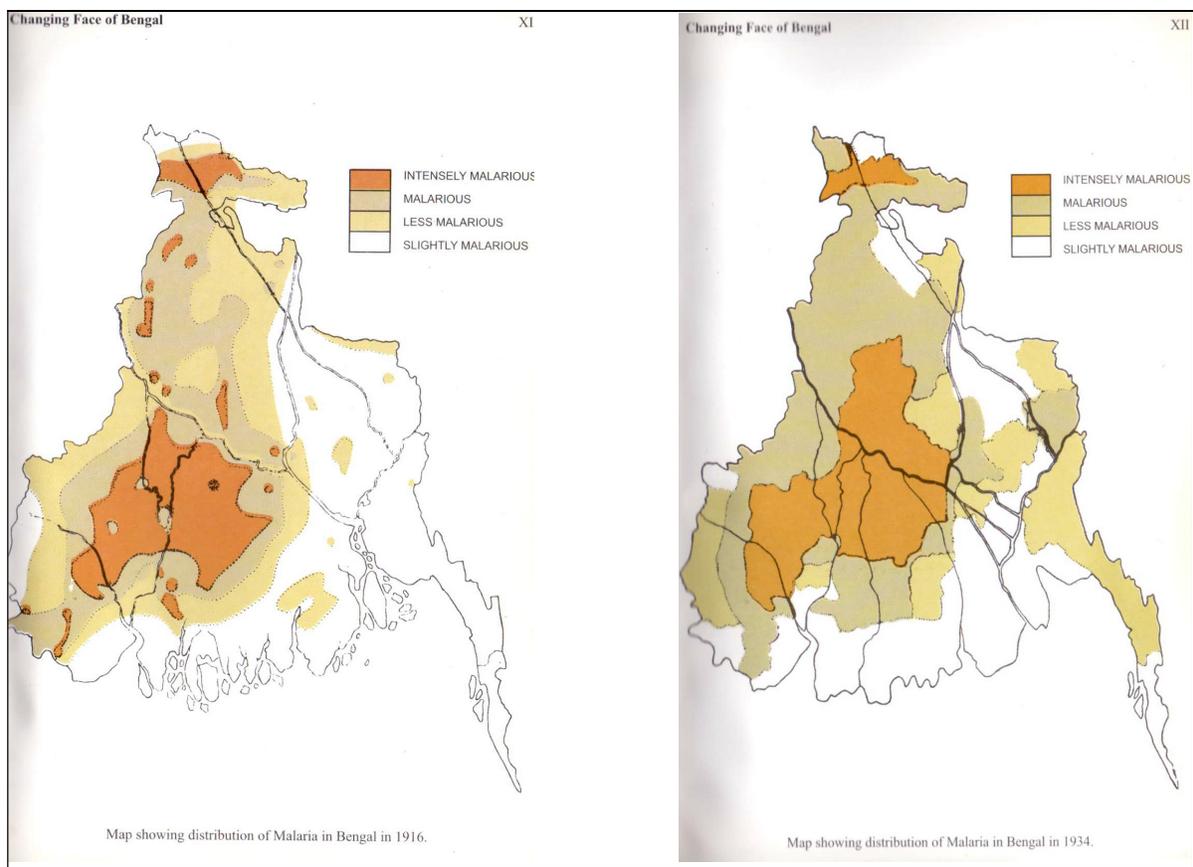
Source: *Report of the Sanitary Commissioner for Bengal for the year 1871*, p. 13

Due to the severe flood in 1871 cholera was broke out throughout the Rajshahi Division. Disease was generally limited to the submerged tracts and their neighbourhood. Deprivation, improper food and exposure to wet and cold were believed to have been greatly instrumental in causing the mortality. It is worth mentioning here that a great many of the cases set down as cholera were categorized as simply bowel complaints.<sup>255</sup> The seasonal distribution of small-pox was between March to May. Small-pox existed in Rangpur, Dinajpur, Bogra and Rajshahi during April, May, and June 1871, but gradually decreased during July and August. Though it disappeared in the rainy season, but reviving again, especially in Rangpur and Rajshahi, in the cold season.<sup>256</sup>

The *Sanitary Report* in the early years of the first decade of twentieth century envisaged that the northern part of the district of Dinajpur was unhealthier than the southern part. The Civil Surgeon of the district was of the opinion that the unhealthiness of the district was due to its water-logged condition caused by the periodical floods and inundations. Most of the deaths reported from the district were ascribed to the malarial fevers. The district was full of old tanks which, being choked with Jungle, form an excellent breeding ground for mosquitoes.<sup>257</sup> Major Rogers in his

Report talked about ‘a remarkable relationship between a high ground water level and high spleen rates and fever mortality of the *thanas* and vice versa.’<sup>258</sup> But the great majority of deaths from chronic fevers of from one to three months duration occurred during the late autumn and early cold weather months while on the other hand the deaths from long-duration fever of nearly six months occurred mostly in the hot weather season with an uniform distribution of chronic malaria over the years – so what remaining ‘the latter half of the cold weather and early part of the hot season’ was the season of ‘minimal’ prevalence of fever.<sup>259</sup> Apart from these cases of diarrhea, dysentery and bowel complaints prevailed throughout the year in the district. In March 1909, Dr. Bentley, a specialist in malaria visited the district of Dinajpur, proposed the clearance of jungle and removal of rubbish which was to be followed by speedy distribution of quinine among the inhabitants of the town . The infection from cholera in Dinajpur was carried by river water because the disease usually seemed to follow the course of one of the bigger rivers flowing through the district.

District of Jalpaiguri had been frequently visited by malarial fever brought into by the coming and prevalence of monsoon season. The malarial fever was rampant from the beginning and end of rains, in the months of March and April, and in September and October.<sup>260</sup> The river Tista divided the Jalpaiguri district into two parts – western part which was moderately malarious and eastern part which was intensely malarious. The latter, i.e. the eastern part which was known as the Western Duars, had a malicious status for malaria and black-water fever which was comparable only to the deadliest regions of Central Africa, was intersected by numerous rivers and streams and with an extra-ordinary heavy rainfall, which was indeed an ideal breeding ground for the anopheles mosquito.<sup>261</sup> Though malaria prevailed in the district throughout the year but it took a violent shape during and after the rains.<sup>262</sup> The fever appeared in the district in 1872 had extended into Purnia, Dinajpur and Rangpur, and affected the people in such a way that sometimes as many as half the inhabitants in a village were down with it at one time. There was a failure in the October rains, causing a prolongation of the hot weather, which might have assisted to originate it.<sup>263</sup>



Map. 4. 6

a. Malarial prevalence in Bengal in 1916

b. Malarial prevalence in Bengal in 1934

Source: Radhakamal Mukerjee, *The Changing Face of Bengal*, Calcutta, 1938.

The relief-work was commenced in November in continuation of that of previous seasons, and went on without interruption till March. Then small-pox appeared in the villages of Bhagoonee and Saldanga in the Boda-Chukla *thannah* jurisdiction.<sup>264</sup> This was suppressed with considerable difficulty on an account of the opposition of Muslim dominated villages, but finally it was overcome. Backett wrote in 1872 that 'After the month of March the Duars are very unhealthy.'<sup>265</sup> The constant necessity of opening the large tracts of Duars for tea plantation exerted the exigencies of investigation regarding the prevalence and deadliness of malaria. Therefore, it was in the imperial interest of the European planters that an enquiry into the occurrence of malaria and especially of black-water fever in the Western Duars had conducted by Dr. Bentley, M. B., and Captain Christopher, I. M. S. in 1907.<sup>266</sup> The enquiry, however, put

forward the theory of Laveran and Ross, which identified the malarial parasite and the causes of its expansion. The enquiry concluded with the remarks that –

“Among Europeans, of whom over 200 reside in the Duars, the incidence of malaria is very high....the mortality among [European] community which consists almost entirely of strong adults in their prime, ranging from 20 to over 75 per 1,000 as compared with a death rate of 7 per 1,000 for the whole of the European population of India... So far the enquiry has been confined mainly to the tea gardens,...among these people, malaria is present to an extraordinary degree... The examination of the blood of young children in the Duars has shown the endemic index to be very high...”<sup>267</sup>

It was not only Falakata and Alipur, but Boda and Patgram blocks were also severely infected by the disease. The ‘true explanation’ of appearance and prevalence of malaria, the enquiry suggested, was rested on the factor namely ‘soil disturbance’ caused by the opening of soil occurred during the ‘course of railway, road or canal construction or extensive building operations’ which engaged the employment of considerable numbers of labourers.<sup>268</sup> Throughout the Duars, as direct result of its numerous labour camps, with their shifting population of mixed character, there existed epidemic manifestations of the disease. As a result of the passing of *Duars Labour Act* in 1912, ‘sanitation and the collection of vital statistics on tea gardens [were] subject to inspection by Government officers’ since there was ‘room for much improvement in the rest of the district.’<sup>269</sup> Colonial intervention in reducing malarial deaths in the Duars region, which was comprised of precious tea leaves, was guided by the economic exigencies to open the area and subsequent increase of plantation lands for commercial purposes. Nandini Bhattacharya has characterized this colonial initiative of malarial research in connection of her thesis of ‘logic of location’ which ‘demonstrates the duality of locality in colonial malaria research.’<sup>270</sup> Not only in the months of monsoon, but malaria happened to be an important phenomenon during the winter time also. In 1930 investigations had been carried out by the Government which recognized a widespread presence of anopheles mosquitoes in the tea garden areas of Duars. The investigation went on for six years (1930-35) which noted an acute presence of infectious mosquitoes between the months of January to March, on the other hand Manson and Ramsay in 1932 found no infected mosquitoes during these months in the tea estates of Sibsagar District of Assam.<sup>271</sup> Apart from malaria peculiar cases of cholera occurred in the Duars where many streams and wells contained the germ of the disease. When the winter rains remained short and streams and wells were in consequence much reduced or dried up, then cholera becomes

epidemic. The worst affected tracts were the *tahsils* of Falakata and Alipur where a considerable number of Mech population resided. The Mech did not bury their carcasses and threw them into the nearest streams which carried those bodies into the forests and thereby polluted the entire water of the streams.<sup>272</sup> The outcome was that the streams outside the forests got infected and the residents in settle tract, dependent on streams for their water, could not avoid infection which frequently aggravated to an epidemic condition.

District of Rajshahi had acquired the status of 'the most feverish districts of the province' due to its alleged condition of 'un-healthiness'. Although cholera occurred extensively in some parts of the district of Rajshahi in 1869, but it was nowhere in an epidemic form. On the contrary, in 1871, produced by the floods, cholera broke out in an epidemic form and it persisted throughout the year accompanied by fever and smallpox.<sup>273</sup> Cholera existed for the whole year, from northern portion of Pooteah the disease travelled rapidly to the north-western and west and reached to Beaulia in the month of November.<sup>274</sup> Though by the end of that year the disease had subsided in almost all the parts of the district but it still prevailed at Singra, Baragaon, and Bagmara. In 1883-84, the district occupied the first place in the list of fever-stricken districts in Bengal. In 1892 and 1893 it again stood at the top of the list and in seven out of the ten years ending in 1900 it appeared as the 'the most feverish districts of the province'.<sup>275</sup> At the same time the district had been frequently visited by severe malarial fever. The cause of this widespread un-healthiness was partly due to the configuration of the district. There was a comparatively high and well drained strip of sandy soil along the Ganges, on the other hand the *Barind* part was another upland tract, and therefore the whole of the centre and east of the district fell within a swampy water-logged depression which acted as the breeding place of the anopheles.<sup>276</sup> The early decades of the twentieth century had witnessed decrease in the number of population in the Rajshahi district to an 'alarming extent' in the southern and eastern part and this decadent area was consisted of Nator Subdivision, Charghat and Puthia thanas.<sup>277</sup> Though a probable cause which had been ascertained with this phenomenon, was perhaps due to a decrease in the means of subsistence, e.g. the decline in the silk industry or to the diminishing fertility of the land, but the reality was something different. The 'bad climate' was the main 'reason' for the decadence of these areas where 'a serious change for the worse in the climate' had been 'operating during the last forty years at least'.

“The change for the worse that [had] taken place in the drainage of the area probably account[ed] for the change in the climate and the deterioration in public health. The Atrai from the north, the Narad and the Baral from the Ganges used to be active streams. Now the Narad [had] dried up entirely, and the Baral and the Atrai streams [were] dying. The Eastern Bengal Railway embankment had been built across the line of drainage. The impaired drainage possibly account[ed] for the prevalence of malaria in these areas. The evil [was] cumulative. Owing to depopulation land, especially homestead, [went] out of use and [was] quickly covered with jungle. Tanks and unrestrained vegetation [bred] mosquitoes and cause[d] further disease and depopulation.”<sup>278</sup>

Thus a large portion of the district had fallen under an adverse natural transformation which was followed by the drying up of the important river channels and further aggravated by human interference in the name of railway embankment.

The year 1870 in the district of Murshidabad had brought havoc by the continuation of cholera which was further aggravated by the severe floods of that year.<sup>279</sup> Cholera, small-pox, fever, diarrhea, and dysentery often took an epidemic form and carried off a large number of people in Bogra district. Cholera was common in *thanas* Dhunot and Shariakandi in the district of Bogra, chiefly in the rainy season when the filthy water speedily spreads the epidemic among the villages.<sup>280</sup> As an anti-malarial campaign Jangipur flood and flush scheme was introduced which helped to flush-out the flood water instead of blocking which caused widespread malaria in the previous years.<sup>281</sup>

Between 1872 and 1881 though there was an increase in 5 per cent in total population in the district of Malda, with the total number of 7, 10, 484 but at the same time southern part of the district lying west of the Mahananda had witnessed a decrease due to spread of malaria during the closing half of the decade.<sup>282</sup> The decade of 1901-11, was the eventful one from the perspective of health and natural conditions, when in 1905, 1906 and 1907 fever prevailed in the district and was accompanied with the heavy floods in 1906. The 1921 census had shown a population of 10, 12, 109 or a decrease of 1.3 per cent that was resulted from the spread of malaria, subsequently came out as an epidemic and lasted for few years, was particularly intense in the central part of the district.<sup>283</sup> On the other hand the District of Malda had been appeared to Hunter as ‘less unhealthy than the Districts of Purnia, Dinajpur, and Rajshahi’ although the eastern portion of the district that was ‘covered with jungles and swamps, and where the soil [was] a damp clay, [was] exposed to the same malarious fever which prevail[ed] in the neighbouring Districts.’<sup>284</sup> Disease

like- epidemic fever (commonly known as ‘Burdwan fever’) with the malarial traits usually appeared ‘after the close of the rains.’ Raja Digamber Mitter, the Indian member of the first Committee appointed by the Government in 1863 to enquire into the causes of the epidemic, traced the occurrence of epidemic fever in Malda, along with the other districts, in the following manner –

“...the fever which goes by the name of the Burdwan fever is not new to the country but is simply an aggravated form of that disease, which rages periodically all over the country after the close of the rains ; the cause of the fever must, therefore, be ever present in the country, though its rigor in an epidemic form can be avoided if proper precautions are taken.”<sup>285</sup>

The environmental conditions prevailed during and after the floods or failure of crops created the background for the disease which was sometime aggravated to epidemics and in these cases the district was credited to the infection from the *Barind* tract and from Gaur.<sup>286</sup> Cholera, gradually dispersing from the outlying parts to the central and most populated and cultivated portions of the district, used to make visit during the two separate seasons - October, November and December, this time along with fever; and another during March, April and May. In many cases of its sudden appearance cholera took away the life of few people. Cholera usually was caused by the hot weather during the mango season (summer season) and towards the end of the rains, when *bhadoi* paddy became the main diet of the common people. On the other hand, fever broke out ‘at the close of the rains and beginning of the cold weather, followed by small-pox which continues occasionally into the rains.’<sup>287</sup> Sporadic cases of cholera were reported from many parts of the district during the first six months of the year 1871, especially when rainfall was deficient. In July it assumed an epidemic form at Monoharpur and gradually spread to the surrounding villages; by the first week of August the disease had travelled to the sudder *thana* and then extended to the north and north-west to *thanas* Khurba, Gajol and Gorgoriba.<sup>288</sup> The rainy season of 1872 had produced small-pox in the country.<sup>289</sup> There was no significant difference in respect of sanitary condition between the municipalities and the villages, and it was informed that Old Malda, particularly, was ‘notoriously insanitary and unhealthy’. The insanitary condition of the district was partly caused by the sedimentation occurred in the Kalindi river in 1881 which affected the flow of water.<sup>290</sup> The outbreak of fever was due to the construction of Kathihar-Godagari railway line which brought out a large number of coolies into the district that produced the collapse of the existed pattern of drainage of the district. Construction of railways sometime

led to the embankment of rivers or lakes, or the process of embankments exclusively, introduced massive diggings that resulted borrow pits which were, according to C. A. Bentley, the Director of Public Health, were 'far more dangerous than large water surfaces, because they invariably possess a lower temperature much more suitable for mosquito larvae than the high temperature to which large collections of water speedily become raised.'<sup>291</sup> In 1910 Major Mc Combie Young had mentioned about the outbreak of malaria in the district during the construction of railway into the district.<sup>292</sup> Malaria also produced great distress for the life of the people and from 1894 to 1899 deaths from malaria were very high which were affected by the considerable inflow of labour across the Mahananda during the cold weather of these years.

The 'un-healthiness' of the district of Rangpur had been attributed to the heavy rainfall combined with an imperfect natural drainage, which was further obstructed by several roads and this made the climate of the district damp and malarious. In addition to the stagnant marshes and swamps which disfigured the country, every village and town site was honeycombed with innumerable pits and hollows, excavated to provide earth for the plinths of houses.<sup>293</sup> The seasonal variation in malarial occurrence was slight rising a little from October to December and declining from February to May<sup>294</sup>, thus showed an extraordinary concentration during the months of rainy season. A very great proportion of the deaths in the district could be ascribed to malaria, for which Dr. T. H. Bonnar had opined that –

"The general level of the district [was] low, especially in the south and east, where the whole country [was] submerged in the rains, the village sites standing out here and there as islands. The country [was] ill-drained and large swamps and marshes occupy the depressions left in the deserted courses of old rivers...The marshes, tanks and pools form[ed] suitable breeding-places for mosquitoes and their mephitic exhalations poison[ed] the atmosphere. These circumstances account[ed] for the widespread prevalence of malaria...there could be no doubt that malaria levie[d] a very heavy toll on the population and that its ravages show[ed] a tendency to increase."<sup>295</sup>

In 1872 the 'whole country seemed prostrated with fever'. There was also cholera or a severe form of bowel complaint in places where the people used to drink the water in which jute had been stepped.<sup>296</sup> The flood of 1915 had produced dysentery and diarrhea throughout the Presidency and the diseases took considerable lives which was higher in the Rajshahi Division than the other divisions.<sup>297</sup> The yearly death-rate between 1911 and 1935, however, had been

shown in a rather fluctuating mode, and particularly there was a steady rise in death rates between 1931 (25.23) and 1935 (27.55), except that was in the year 1932 (20.72) when it was comparatively low.<sup>298</sup> Cholera, was endemic throughout the year, but took an epidemic form twice a year – from April to June, and from November to January, which was largely affiliated with insanitary habits of the people of the district. Small-pox occurred in epidemic form along the navigable rivers and the infection had been brought into by the migratory boatmen.<sup>299</sup>

Drainage seemed to be an evocative question for the colonial administration regarding the ameliorations of the conditions and there was increasing exertions of the ideas that sufficient drainage could solve the issue of malarial visitations. On the contrary Bentley had argued that it was inappropriate to undertake any conclusive remark regarding the malaria mitigation through the development of drainage conditions. He was of the opinion that ‘malaria in the delta tracts [was] not associated with a great excess of surface water, even when that excess produces actual water-logging of the land and damage to the crops’ rather ‘an intensification of the disease occur[ed] wherever the partial drying up of the country [was] carried beyond a certain point’.<sup>300</sup> Moreover, floods were considered as helpful in confronting the malarial attack. In support of his argument Bentley had quoted from Hirsch’s *Handbook of Geographical and Historical Pathology* –

“The fact that when the water is high and the ground completely covered by it, the endemic or epidemic disappears, fresh cases of the disease appearing only after the water has run off and the surface of the country has been laid bare. ...the fact in those rice-fields in India which are always under water,...are the least dangerous to health...the complete flooding of marshy ground, and the feeling up of standing pools, ditches, and the like causes the endemic to disappear as certainly as if they had been dried up.”<sup>301</sup>

A Bill to facilitate drainage in certain parts of Bengal was introduced into law as Act V of 1871.<sup>302</sup> Drainage pattern which largely depended on the nature of land and soil remained problematic for many of the districts of north Bengal. Drainage condition affecting the inflow and outflow of water had contributed to the lengthening or shortening the period of inundations. Drainage had seemed to be a major problem in Rangpur even during the 70s of the nineteenth century and the unhealthiness of Rangpur had been ascribed to its poor drainage condition.

Cholera had prevailed in certain parts of the Princely State of Cooch Behar during the months of August and November 1886 chiefly in the areas of Daribash in the Haldibari Sub-division, and at Kholta in the Sudder Sub-division.<sup>303</sup> Though it subsided by the end of the year but in the end of March 1887 cholera again began to assume an epidemic form, and during the whole of the hot weather especially in the months of April, May and June, again towards the end of the rains, it raged furiously all over the State.<sup>304</sup> Haldibari, part of Mekhliganj, Dinhata, Mathabhanga, Sitalkhuchi, Foolbari were the places which were affected severely, but with a striking absence of any serious cases in the town of Cooch Behar. Out of a total population of 6, 02, 624 no less than 3,178 persons were attacked of which 2,779 died and only 399 recovered.<sup>305</sup>

Table. 4.6

Deaths caused by cholera in 1887 in Cooch Behar

	No. of cases	Deaths	Recoveries
Those treated in Hospital	15	2	13
Treated by Compounders and Police	879	650	229
Treated by Kabirajes	1,113	1,000	113
Not treated	1,186	1,129	57

Source: *The Annual Administration Report of the Cooch Behar State for the year 1887-88*, p. 26.

The flood of 1906 had brought out numerous cases of cholera which broke out in the most parts of the State of Cooch Behar. Not only cholera, small-pox was also prevalent in the State. There were 1816 cases of cholera as against 671 and 132 cases of small pox as against 81 in the previous years.<sup>306</sup> The adverse condition for the year 1906 was due to severe inundations. Due to erratic rainfall throughout the year 1918 in the Princely States of Cooch Behar, cholera broke out in all the sub-divisions and small-pox also erupted everywhere. 996 persons against 62 of the previous year died of cholera all over the State. The disease broke out in virulent form in the Sudder and in the Tufangunj sub-divisions where 253 and 449 persons had succumbed to death out of total attack of 301 and 531 persons respectively. The number of deaths from small-pox in the State was 56 against 271 of the previous year.<sup>307</sup> During the year 1934-35, 249 people were

attacked by cholera out of which 180 persons were died and the percentage of death was 72.28 which in the previous year was 74.18.<sup>308</sup> Small-pox which broke out in epidemic form took 203 lives while attacked 998 persons in the Sudder and other parts of the State - the highest number of death was reported from the Kotwali area where the number was 185.<sup>309</sup>

## ***Conclusion***

There was enough evidence to believe that colonial ideology of riparian legislation related to embankments, drainage and irrigation were meant to serve the colonial purpose instar of providing any sustainable relief to the Indians. Sir William Willcocks, original designer of the Aswan Dam in Egypt, who began his career as an irrigation engineer in Bengal, accused the British in the 1920s of purposely preventing irrigation systems within the Bengal Presidency where irrigation system was introduced to protect their roads and railways and thus secure a continuing flow of raw materials to the industries in England.<sup>310</sup> Floods sometime proved to be good not only for the crops which had been provided with ample sources of water and silt deposits that contributed to the fertilization of the soil, but flood produced new land for cultivation by the silt deposits which frequently were used for the increasing areas of cultivation from which increasing revenue could be drawn for the imperial authority. The natural supply of flood water had been by justified by the Government of having ‘only in a minor degree that irrigation for cultivation [came] within the Department’s scope.’<sup>311</sup> This sometime prevented the landlords to adopt any flood-preventive measure and inspired them to encourage the silting up of river channels. In a report to the Bengal Land Revenue Commission in 1939, the Bengal Provincial Kisan Sabha, a peasant organization, noted:

“Not only do the landlords fail to clear away the silt and to re-excavate the blocked channels and waterways and tanks; on the contrary, they often encourage the silting up of these waterways so as to form new fields which they can lease out to new tenants. A very common form of litigation...is where cultivators attempted to keep open long-established waterways but have been forcibly driven off the land by the hired gangsters of the landlords who are preparing to sow a crop in the silted up river bed.”<sup>312</sup>

Sometime continuous silting of river channels transformed the nature of the soil and aggravated peasant distress. The formation of new lands for cultivation was lucrative for the colonial State. But the constant silting of deposits had affected the flow of water in the river channels and the Irrigation Committee which was constituted under the Chairmanship of Mr. W. S. Hopkins in 1930 had reported that in the northern districts ‘where the rivers which once built up the delta of the Ganges now lie stagnant, the most important problem is to restore the flow of water in the rivers.’<sup>313</sup> Though during the second half of the nineteenth century efforts had been made to restore the existing irrigation canals in Bengal, but Wilcocks had prescribed for the discontinuation of this process of restoration of any ‘ancient artificial systems of irrigation’. Problems in restoring flood water were manifested in a different way for Malda and Rajshahi districts where the floods were so heavy that it obstructed the monsoon harvest and the water receded so quickly that no water was remained available for cold weather irrigation.<sup>314</sup> Thus flood water were wasted in these districts along with Dinajpur which were peculiarly liable to the failure of crops, but if it could have been properly used through appropriate construction of further canals or any other way then it would definitely prove to be beneficial for the people of those regions. As a part of anti-malarial campaign sometime the surplus flood water had been driven to flow in the country so they could submerge as large an area as possible and thus destroying the breeding grounds of the anopheles.<sup>315</sup>

The impact of artificial embankments can be best understood in the words of Sir Wilcocks who was borne ‘in a tent or an irrigation canal’ in India in some 1853:

“If you embank the rivers and prevent their overflowing altogether and leave no openings in the banks, you doom the country to malaria and impoverishment of soil; but that is not all the harm you do. By confining high floods to their river channels, you congest the rivers to bursting point and expose the country to various serious inundations and devastations.”<sup>316</sup>

Wilcocks had warned the Government that excessive dependence on rainfall could impoverish the soil and produce malaria. The consecutive river irruptions in northern Bengal were no less caused by the sporadic embankments constructed according to the needs and profits of the colonial Government. Embankments which supposed to be a major concern for reducing the danger of flood occurrences sometimes even heightened the tensions among the flood victims because the colonial hydrology had yet to tap new tools or solutions for diminishing the

hazardous effects of inundation in the northern part of Bengal. Thus Christopher Hill argues that: “Indeed, perhaps more than any other proprietary action taken by the British in South Asia, riparian law exemplifies the pitfalls and ramifications of the attempt to universalize a flawed, imported land policy.”<sup>317</sup> It can be observed from the above discussions that the colonial Government was more inclined to ‘control’ the rivers on their own terms which proved injurious for the colonized people and mere designating the rivers as source of profit overlooked the very existence of rivers as source of life and livelihood. Kuntala Lahiri-Dutt has argued that ‘...the move from ‘mother’ nature to ‘obedient daughter’ river has been detrimental to human welfare.’<sup>318</sup> Rohan D’Souza is of the opinion that ‘Colonial water technologies such as weirs, dams and barrages, oriented towards delivering perennial irrigation for settled agriculture, in most instances, proved unable to not only coexist with traditional systems but were sharply aimed at eliminating the latter as well.’<sup>319</sup>

Floods had produced famine conditions at several occasions. South Asian famines, as addressed by the scholars so far, generally owed to the shortage of rainfall, but the chapter demonstrates the occurrences of famine conditions or famines which were caused by the excessive rainfall. The large scale destruction of crops and commodities had resulted to widespread increase of prices and aggravated enduring poverty of the people who had to move through a complex relationship between environment, social ecology and subsistence at the time of floods. Floods in the hilly tracts brought about considerable loss of forest and plantation lands which provided a major blow to the bare subsistence of the forest dwellers and tea plantation workers. Soil erosion, loss of crops and cattle had been instrumental to transform the agricultural and economic setting of the region where the floods occurred. What the colonial government lacked was the understanding of the fact that flood should have to be controlled first at the ‘local level’ where the floods first appeared instead of bringing large artificial barriers to the natural flow of water.<sup>320</sup> Colonial period witnessed a massive phase of deforestation of the subcontinent which is said to believe a major cause of floods. But recent researches have shown that afforestation could not solve the problem of frequent flooding of the Himalayan rivers which could be rarely controlled by the embankments because ‘the Himalayan mountains constitute an extremely fragile ecological system [which] are the youngest mountains of the world and, therefore, highly erodible.’<sup>321</sup>

## Notes and References:

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<sup>1</sup> W. W. Hunter, *A Statistical Account of Bengal, vol. X: Districts of Darjiling, and Jalpaiguri and State of Kuch Behar*, Trubner & Co., London, 1876, p. 226.

<sup>2</sup> James Rennel, *Memoir of a Map of Hindustan; or the Mughal Empire*, W. Bulmer & Co., London, Second Edition, 1792, p. 352.

<sup>3</sup> John. F. Gruning, *Eastern Bengal and Assam District Gazetteers: Jalpaiguri*, Pioneer Press, Allahabad, 1911, p. 7.

<sup>4</sup> W. W. Hunter, *op. cit.*, p. 226.

<sup>5</sup> Rajat Datta, *Society, Economy and the Market: Commercialization in Rural Bengal, c. 1760-1800*, Manohar, New Delhi, 2000, p. 250.

<sup>6</sup> W. W. Hunter, *A Statistical Account of Bengal, vol. VII*, p. 294

<sup>7</sup> *Ibid.*

<sup>8</sup> The members of the Board of Revenue failed to understand the gravity of the situation and displayed a sense of insincerity through recruiting “a staff of surveyors (*amins*) ... to inquire into the extent of the losses sustained, and the zamindars continued to hold their estates on the understanding that they would be allowed remissions corresponding to their losses, on the termination of the inquiry.” *Ibid.*, p. 295.

<sup>9</sup> J. A. Vas, *Eastern Bengal and Assam District Gazetteers: Rangpur*, Pioneer Press, Allahabad, 1911, p. 75.

<sup>10</sup> In the northern part of Rangpur Tista flowed through a small stream, “which found its way by a circuitous course past Ulipur to the Brahmaputra, a little north of the confluence of the Ghaghat with that river.” The new stream caused by the overflow of waters turned itself into the Ghaghat. *Ibid.*

<sup>11</sup> W. W. Hunter, *A Statistical Account of Bengal, vol. VII*, p. 296.

<sup>12</sup> Estimate of D. H. MacDowall, Collector of Rangpur, 28 June, 1789. Cited in, Rajat Datta, *op. cit.*, p. 256.

<sup>13</sup> W. W. Hunter, *op. cit.*, p. 296.

<sup>14</sup> *Ibid.*

<sup>15</sup> *Ibid.*

<sup>16</sup> J, A. Vas, *op. cit.*, p. 76.

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<sup>17</sup> *Ibid.*

<sup>18</sup> *Ibid.*

<sup>19</sup> W. W. Hunter, *op. cit.*, p. 297.

<sup>20</sup> *Ibid.*

<sup>21</sup> *Ibid.*

<sup>22</sup> J. A. Vas, *op. cit.*, p. 76.

<sup>23</sup> *Ibid.*

<sup>24</sup> *Ibid.*

<sup>25</sup> W. W. Hunter, *op. cit.*, p. 297.

<sup>26</sup> Binay Bhushan Chaudhury, *Agricultural Growth in Bengal and Bihar, 1770-1860: Growth of Cultivation since the Famine of 1770; Bengal Past and Present*, 95, 1976. Though the peasant unrest in Birbhum triggered by the introduction of *Jummabandi* but the halting of reclamation process suffered a serious setback throughout the districts of Dinajpur and Rangpur. p. 300 and 303.

<sup>27</sup> Rajat Datta, *op. cit.*, pp. 292-93.

<sup>28</sup> *Ibid.*, p. 291.

<sup>29</sup> *Ibid.*, p. 301.

<sup>30</sup> B. Chaudhury, *Eastern India*, in Daharma Kumar (ed.), *The Cambridge Economic History of India, Vol. II: c. 1757-2003*, Orient Blackswan & Cambridge University Press, New Delhi, 2008, p. 290.

<sup>31</sup> Rajat Datta, *op. cit.*, p. 301.

<sup>32</sup> J. A. Vas, *op. cit.*, p. 5.

<sup>33</sup> W. W. Hunter, *A Statistical Account of Bengal, Vol. X*, pp. 124-25.

<sup>34</sup> W. W. Hunter, *A Statistical Account of Bengal, Vol. VII: Districts of Malda, Rangpur and Dinajpur*, Trubner & Co., London, 1876, p. 90.

<sup>35</sup> L. S. S. O'Malley, *Bengal District Gazetteers: Rajshahi*, Bengal Secretariat Book Depot, Calcutta, 1916, p. 92.

<sup>36</sup> *Ibid.*

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<sup>37</sup> *Ibid.*, p. 93.

<sup>38</sup> P. C. Mahalanobis, *Report on Rainfall and Floods in North Bengal, 1870 – 1922*, Bengal Secretariat Book Depot, Calcutta, 1927, p. 1.

<sup>39</sup> *Ibid.* p. 2.

<sup>40</sup> L. S. S. O'Malley, *Bengal District Gazetteers: Murshidabad*, Bengal Secretariat Book Depot, Calcutta, 1914, pp. 116.

<sup>41</sup> *Ibid.*

<sup>42</sup> *Ibid.*, p. 117.

<sup>43</sup> W. W. Hunter, *A Statistical Account of Bengal, Vol. IX: Districts of Murshedabad and Pabna*, Trubner & Co., London, 1876, p. 132.

<sup>44</sup> L. S. S. O'Malley, *Bengal District Gazetteers: Murshidabad*, p. 117.

<sup>45</sup> W. W. Hunter, *A Statistical Account of Bengal, Vol. IX: Districts of Murshedabad and Pabna*, p. 133.

<sup>46</sup> L. S. S. O'Malley, *Bengal District Gazetteers: Murshidabad*, p. 117.

<sup>47</sup> [Proceedings No. 141.] From Baboo Bunkim Chander Chatterjee, Deputy Collector, to the Collector of Moorshedabad, - (No. 37, dated Berhampore, the 6th September 1870), progs no. 141, *Proceedings of the Lieutenant-Governor of Bengal during September 1870 (Revenue Department)*, West Bengal State Archives (henceforth WBSA).

<sup>48</sup> *Ibid.*

<sup>49</sup> Daily reports from the officer in charge of the Maldah district of all correspondences, information of which was received on the 30th July 1870, dispatched same date at 3 p.m., progs. No. 77, *Proceedings of the Lieutenant-Governor of Bengal during September 1870 (Revenue Department)*, WBSA.

<sup>50</sup> From N. S. Alexander, EsQ., Officiating Collector of Maldah, to the Commissioner of the Rajshahye Division, - (No. 500, dated Maldah, the 16<sup>th</sup> August 1870), progs. No. 78, *Proceedings of the Lieutenant-Governor of Bengal during September 1870 (Revenue Department)*, WBSA.

<sup>51</sup> From H. S. Beadon, EsQ., Officiating Under Secretary to the Government of Bengal, to the Commissioner of the Rajshahye Division. – (no. 3416, dated Fort William, dated the 29<sup>th</sup> August 1870), progs no. 79, *Proceedings of the Lieutenant-Governor of Bengal during September 1870 (Revenue Department)*, WBSA.

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<sup>52</sup> From F. G. Millett, EsQ., Officiating Collector of Rungpore, to the Commissioner of the Rajshahye Division, - (No. 175, dated Rungpore, the 6<sup>th</sup> August 1870), progs no. 81, *Proceedings of the Lieutenant-Governor of Bengal during September 1870 (Revenue Department)*, WBSA.

<sup>53</sup> Letter from J. Tweedie, Officiating Magistrate to C. E. Lance, Officiating Commissioner of the Rajshahye Division (dated Pubna, the 31st July 1870), progs. No. 84, *Proceedings of the Lieutenant-Governor of Bengal during September 1870 (Revenue Department)*, WBSA.

<sup>54</sup> *Ibid.*

<sup>55</sup> From J. C. Veasey, EsQ., Assistant Collector of Serajgunge, to the Collector of Pubna, - (No. 111, dated Serajgunge, the 29<sup>th</sup> July 1870), progs no. 86, *Proceedings of the Lieutenant-Governor of Bengal during September 1870 (Revenue Department)*, WBSA.

<sup>56</sup> *Ibid.*

<sup>57</sup> [Proceedings No. 88] From J. Tweedie, EsQ., Officiating Collector of Pubna, to the Commissioner of the Rajshahye Division, - (No. 340, dated Pubna, the 9<sup>th</sup> August 1870), progs. no. 88, *Proceedings of the Lieutenant-Governor of Bengal during September 1870 (Revenue Department)*, WBSA.

<sup>58</sup> From J. Ward, EsQ., Officiating Magistrate of Rajshahye, to the Commissioner of the Rajshahye Division, - (No. 69A., dated Beaulah, the 12<sup>th</sup> August 1870), progs. No. 92, *Proceedings of the Lieutenant-Governor of Bengal during September 1870 (Revenue Department)*, WBSA.

<sup>59</sup> P. C. Mahalanobis, *op. cit*, p. 51.

<sup>60</sup> *Ibid.*

<sup>61</sup> Jatindra Chandra Sengupta, *West Bengal District Gazetteers: Malda*, Sree Saraswati Press, Calcutta, 1969, p. 97.

<sup>62</sup> G. E. Lambourne, *Bengal District Gazetteers: Malda*, The Bengal Secretariat Book Depot, Calcutta, 1918, p. 50.

<sup>63</sup> L. S. S. O'Malley, *Bengal District Gazetteers: Rajshahi*, p. 92.

<sup>64</sup> *Ibid.*

<sup>65</sup> W. W. Hunter, *A Statistical Account of Bengal, Vol. VIII: Districts of Rajshahi and Bogra*, Trubner & Co., London, 1876, p. 79.

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<sup>66</sup> C. E. Buckland, *Bengal under the Lieutenant Governors: A Narrative of the Principal Events and Public Measures during Their Periods of Office from 1854 to 1898, Vol. I.*, S. K. Lahiri & Co, Calcutta, 1901, p. 495.

<sup>67</sup> *The Hindoo Patriot* – week ending September 11, cited in P. C. Mahalanobis, *op. cit.*, p. 51.

<sup>68</sup> C. E. Buckland, *op. cit.*, Vol. I., p. 494.

<sup>69</sup> P. C. Mahalanobis, *op. cit.*, p. 52.

<sup>70</sup> *Ibid.*, p. 53.

<sup>71</sup> *Ibid.*

<sup>72</sup> *Ibid.*, p. 54.

<sup>73</sup> Harendra Narayan Chaudhury (compl.), *The Cooch Behar State and its Land Revenue Settlements*, The Cooch Behar State Press, Cooch Behar, 1903, p. 78.

<sup>74</sup> *The Annual Administration Report of the Cooch Behar State for the year 1878-79*, Cooch Behar State Press, Cooch Behar, 1879, p. 11.

<sup>75</sup> *Ibid.*, p. 12

<sup>76</sup> P. C. Mahalanobis, *op. cit.*, p. 55.

<sup>77</sup> *Ibid.*

<sup>78</sup> T. H. Wickes, Superintending Engineer, South Eastern Circle, *Report on the Inundations of 1885 in the South-Western Circle*, Encloser Of Govt. Of Bengal, P. W. D (No. 807½ of 9-6-1886) in *Government Of Bengal, Revenue Department, Famine Branch – Proceedings for February 1887 (File No. 7, Serial No. 9/18)*, WBSA.

<sup>79</sup> *Ibid.*

<sup>80</sup> C. E. Buckland, *Bengal under the Lieutenant Governors: A Narrative of the Principal Events and Public Measures during Their Periods of Office from 1854 to 1898, Vol. II*, S. K. Lahiri & Co., Calcutta, 1901, p. 822.

<sup>81</sup> T. H. Wickes, *Report on the Inundations of 1885 in the South-Western Circle*, WBSA.

<sup>82</sup> *Ibid.*

<sup>83</sup> *Ibid.*

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- <sup>84</sup> C. E. Buckland, *op. cit.*, Vol. II., p. 822.
- <sup>85</sup> L. S. S. O'Malley, *Bengal District Gazetteers: Murshidabad*, p. 117.
- <sup>86</sup> G. E. Lambourne, *op. cit.*, p. 50.
- <sup>87</sup> P. C. Mahalanobis, *op. cit.*, p. 56.
- <sup>88</sup> *Ibid.*, p. 57.
- <sup>89</sup> T. H. Wickes, *Report on the Inundations of 1885 in the South-Western Circle*.
- <sup>90</sup> *Ibid.*
- <sup>91</sup> *Ibid.*
- <sup>92</sup> Government of Bengal, Revenue Department, Famine Branch – Proceedings for February 1887 (File No. 7, Serial No. 9/18) Collection. I - No. 26b February /87; Subject: *Fate of The Crops in Bengal*, Proceedings No. B- 12-29, WBSA.
- <sup>93</sup> C. E. Buckland, *op. cit.* Vol. II., p. 822.
- <sup>94</sup> Cited in P. C. Mahalanobis, *op. cit.*, p. 56.
- <sup>95</sup> G. E. Lambourne, *op. cit.*, p. 50.
- <sup>96</sup> *Ibid.*
- <sup>97</sup> P. C. Mahalanobis, *op. cit.*, p. 57.
- <sup>98</sup> *The Bengal Administration Report*, cited in P. C. Mahalanobis, *op. cit.*, p. 58.
- <sup>99</sup> J. N. Gupta, *District Gazetteers of Eastern Bengal and Assam: Bogra*, Pioneer Press, Allahabad, 1910, p. 74.
- <sup>100</sup> *Ibid.*
- <sup>101</sup> Harendra Narayan Chaudhury, *op. cit.*, p. 79.
- <sup>102</sup> L. S. S. O'Malley, *Bengal District Gazetteers: Pabna*, Bengal Secretariat Book Depot, Calcutta, 1923, pp. 45-46.
- <sup>103</sup> *Ibid.* p. 46.
- <sup>104</sup> F. W. Strong, *Eastern Bengal and Assam District Gazetteers: Dinajpur*, Pioneer Press, Allahabad, 1912, p. 64.
- <sup>105</sup> *Ibid.*

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<sup>106</sup> *Ibid.*

<sup>107</sup> P. C. Mahalanobis, *op. cit.*, p. 63.

<sup>108</sup> Harendra Narayan Chaudhury, *op. cit.*, p. 79.

<sup>109</sup> P. C. Mahalanobis, *op. cit.*, p. 63.

<sup>110</sup> *Ibid.*, p. 64.

<sup>111</sup> Harendra Narayan Chaudhury, *op. cit.*, p. 79.

<sup>112</sup> *Ibid.*, p. 65.

<sup>113</sup> *The Bengal Administration Report*, cited in *Ibid.*

<sup>114</sup> L. S. S. O'Malley, *Bengal District Gazetteers: Darjeeling*, p. 129.

<sup>115</sup> *Ibid.*, p. 130.

<sup>116</sup> See Ch. II.

<sup>117</sup> E. C. Dozey, *A Concise History of the Darjeeling District since 1835 with a Complete Itinerary Tours in Sikkim and the District*, N. Mukherjee, Calcutta, 1922, pp. 140 - 41.

<sup>118</sup> Cited in E. C. Dozey, *op. cit.*, pp. 141 – 42.

<sup>119</sup> *The Fairfield News and Herald*, Winnsboro. S. C., Wednesday, October 4, 1899. Vol. LIV, No. 8.

<sup>120</sup> *The Argus*, Melbourne, Monday, 2 October, 1899.

<sup>121</sup> Ada Lee, *Seven Heroic Children: A Great Sorrow and a Great Victory*, Morgan and Scott, London, 1906, p. 32.

<sup>122</sup> *Ibid.*, p. 38.

<sup>123</sup> [http://www.sjcnorthpoint.com/1899\\_08.php](http://www.sjcnorthpoint.com/1899_08.php). Accessed on 5/5/2015.

<sup>124</sup> L. S. S. O'Malley, *Bengal District Gazetteers: Darjeeling*, p. 131.

<sup>125</sup> Arthur Jules Dash, *Bengal District Gazetteers: Darjeeling*, Bengal Government Press, Alipore, 1947, p. 11.

<sup>126</sup> L. S. S. O'Malley, *Bengal District Gazetteers: Darjeeling*, p. 136.

<sup>127</sup> *Ibid.*, pp. 136-37.

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<sup>128</sup> P. C. Mahalanobis, *op. cit.*, p. 68.

<sup>129</sup> *Ibid.*, p. 69.

<sup>130</sup> *Ibid.*

<sup>131</sup> John. F. Gruning, *op. cit.*, p. 74.

<sup>132</sup> Deputy Commissioner's report of the flood. Cited in John. F. Gruning, *op. cit.*, pp. 74-75.

<sup>133</sup> *Ibid.*, p. 75.

<sup>134</sup> *Ibid.*

<sup>135</sup> *Ibid.*, p. 76.

<sup>136</sup> *Ibid.*

<sup>137</sup> *Amrita Bazar Patrika*, August 18, cited in P. C. Mahalanobis, *op. cit.*, p. 68.

<sup>138</sup> L. S. S. O'Malley, *Bengal District Gazetteers: Murshidabad*, pp. 117.

<sup>139</sup> *Ibid.*

<sup>140</sup> *Ibid.* Another severe inundation occurred in Murshidabad in 1907, when 'the Lalitakuri embankment gave way in the Lalbagh subdivision', and as a result there was a partial failure of the winter rice crop.

<sup>141</sup> John. F. Gruning, *op. cit.*, p. 76.

<sup>142</sup> *Ibid.*

<sup>143</sup> *Ibid.*

<sup>144</sup> *Ibid.*, p. 78.

<sup>145</sup> *Ibid.*

<sup>146</sup> *Ibid.*

<sup>147</sup> *Ibid.*

<sup>148</sup> Ranajit Dasgupta, *Labour and Working Class in Eastern India: Studies in Colonial History*, K. P. Bagchi and Co., Calcutta, 1994, pp. 263-264.

<sup>149</sup> G. E. Lambourne, *op. cit.*, p. 56.

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<sup>150</sup> *Ibid.*

<sup>151</sup> *The Bengalee*, 15 September 1906, cited in P. C. Mahalanobis, *op. cit.*, p. 73.

<sup>152</sup> *The Bengalee*, 11 September 1906, cited in *Ibid.*

<sup>153</sup> *Ibid.*

<sup>154</sup> *The Annual Administration Report of the Cooch Behar State for the year 1906-07*, Cooch Behar State Press, Cooch Behar, 1907, p. 4.

<sup>155</sup> *Ibid.*

<sup>156</sup> Annual Administration Report of the Department of General Administration and Criminal Justice of the Cooch Behar State for the year 1906-1907 in *The Annual Administration Report of the Cooch Behar State for the year 1906-07*, p. 15.

<sup>157</sup> *Amrita Bazar Patrika*, July 18, 22, 1910, cited in P. C. Mahalanobis, *op. cit.*, p. 75.

<sup>158</sup> *The Englishman*, August 16, 1915, cited in P. C. Mahalanobis, *op. cit.*, p. 77.

<sup>159</sup> *Amrita Bazar Patrika*, September 3, 6, 8, 1915, cited in *Ibid.*

<sup>160</sup> W. N. Nelson, *Final Report on the Survey and Settlement Operations in the District of Rajshahi, 1912-1922*, Bengal Secretariat Book Depot, Calcutta, 1923, p. 8.

<sup>161</sup> Rainfall in the neighbouring districts was also considerably high. In the month of August, six of the rainfall stations in the district of Dinajpur had recorded a fall of over 35 inches against a normal figure of 12.15, while in Bogra, the rainfall was 26.33 inches as compared with an average of 11.12. *Ibid.*

<sup>162</sup> *The Administration of Bengal under the Earl of Ronaldshay, G.C.I.E., 1917-22*, p. 39.

<sup>163</sup> *Ibid.*, pp. 39-40.

<sup>164</sup> *Final Report on the Survey and Settlement Operations in the District of Rajshahi, 1912-1922*, p. 8.

<sup>165</sup> *Ibid.*

<sup>166</sup> *Ibid.*, pp. 8-9.

<sup>167</sup> *Amrita Bazar Patrika*, September 7, 1918, cited in P. C. Mahalanobis, *op. cit.*, p. 78.

<sup>168</sup> *The Administration of Bengal under the Earl of Ronaldshay, G.C.I.E., 1917-22*, p. 40.

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<sup>169</sup> *Ibid.*

<sup>170</sup> *Amrita Bazar Patrika*, September 5, 1918, cited in P. C. Mahalanobis, *op. cit.*, p. 79.

<sup>171</sup> *The Bengalee*, September 1, 1918, cited in *Ibid.*, p. 78.

<sup>172</sup> *The Annual Administration Report of the Cooch Behar State for the year 1918-1919*, Cooch Behar State Press, Cooch Behar, 1919, p. 3. The excess of rainfall for the year 1918 was 43.40 inches.

<sup>173</sup> *Ibid.*

<sup>174</sup> *Ibid.*, p. 4.

<sup>175</sup> The number of lives lost in different places of the State was as follows – Kotwali Police Station – 12, Tufangunj – 13, Dinhata – 19, Mathabhanga – 10, Shitalkhuchi – 1, Mekligunj Police Station – 6, Haldibari – 6. Report submitted by the Vice-President, State Council in *The Annual Administration Report of the Cooch Behar State for the year 1918-1919*, p. 7.

<sup>176</sup> Mahalanobis, *op. cit.*, p. 82.

<sup>177</sup> *Ibid.*

<sup>178</sup> Cited in *Ibid.*, pp. 83-84.

<sup>179</sup> *Ibid.*, p. 84.

<sup>180</sup> Meghnad Saha, 'The Great Flood in North Bengal', *Modern Review*, vol. 32, November, 1922, p. 605.

<sup>181</sup> Saha had commented that the country was consisted of two well-defined geological tracts – the old alluvia to the west locally known as the Barind, which is a colloquial form of Varendra, the classical name of the country, and the newer diluvial formations of the Brahmaputra to the east. The bank of Karatoya may be taken to be the watershed dividing the basin of the Atrai from that of the Jumna. The Atrai was flowing through the confines of the old alluvial formation. The lower course of the Atrai, near about Nator, crossed through a natural depression, the centre of which was occupied by the Chalan *bil*, lying between the Pabna and the Rajshahi districts. *Ibid.*, p. 606.

<sup>182</sup> "The railway system in this tract consist[ed] of two sections, the lower one, from Sara to Santahar being a double line, in which the old meter gauge line exist[ed] side by side with the new broad gauge line constructed a few years ago. The upper part, from Santahar to Jalpaiguri consist[ed] of the meter gauge line,... Santahar [was] an important railway junction, from which another line [had] breached off,..to Bogra... Besides these lines, there [was] the Sara-Serajgunj

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line, further south, a broad gauge line which the Chalan bil area, thus effectively blocking the chief water course of Northern Bengal.” *Ibid.*, pp. 606-607.

<sup>183</sup> *Ibid.*, p. 607.

<sup>184</sup> *Amrita Bazar Patrika*, November 6, 1922.

<sup>185</sup> Meghnad Saha, *op. cit.*, p. 608.

<sup>186</sup> *Ibid.*, p. 609.

<sup>187</sup> James Rennell, *Memoir of a Map of Hindustan or the Mughal Empire*, W. Bulmer & Co., London, 1792, p. 349.

<sup>188</sup> For details see Ujjayan Bhattacharya, ‘From Surveys to Management: The Early Colonial State’s Intervention in Water Resources of Bengal,’ *Indian Historical Review*, Vol. 44, No. 2, 2017, pp. 225-251.

<sup>189</sup> Henry Leland Harrison, *The Bengal Embankment Manual*, Bengal Secretariat Press, Calcutta, 1875, p. 75 (v).

<sup>190</sup> The Manual had also re-defined certain terms such as – ‘estate and zemindar’, ‘tenure and proprietor’ especially for this case. “The word ‘zemindar’ means any holder or holders of an estate, which term includes lands on the lakhiraj register and lands acquired under the waste land rules. Thus lakhirajdars, who have hitherto escaped, will have to bear their fair share in the works by which their properties benefit. Proprietors, that is, owners of *tenures*, are by Section 45 made to contribute their fair share of the cost; but it will be observed that the definition of ‘tenure’ limits it to interests held *permanently* at a fixed rental, or held lakhiraj. Thus a liability to have his rent enhanced protects a person possessing any interest in land from being assessed, an obviously just provision. Owners of lakhiraj plots of land will, under all circumstances, have to contribute if benefited. Section 46 giving the Collector the fullest powers to assess them. On the other hand, unless the definition of tenures will include public property—such as canals, roads, railroads,—such property will not be liable to contribute.” *Ibid.*, p. 22.

<sup>191</sup> *Ibid.*, p. 10.

<sup>192</sup> *Proceedings of the Council of the Lieut.-Governor of Bengal for the Purpose of Making Laws and Regulations*, Vol. XIV – 1882, Bengal Secretariat Press, 1883, p. 2.

<sup>193</sup> *Ibid.*, p. 6.

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<sup>194</sup> For details see Ritika Prasad, *Tracks of Change: Railways and Everyday Life in Colonial India*, Cambridge University Press, New Delhi, 2015, pp. 99-101.

<sup>195</sup> Tirthankar Roy, *Natural Disasters and Indian History*, Oxford University Press, New Delhi, 2014 (first edition 2012), p. 76.

<sup>196</sup> *Proceedings of the Council of the Lieut.-Governor of Bengal for the Purpose of Making Laws and Regulations, Vol. XIV – 1882*, p. 4.

<sup>197</sup> *The Bengal Embankment Manual*, p. 24.

<sup>198</sup> *Ibid.*

<sup>199</sup> *Ibid.*, pp. 24-25.

<sup>200</sup> Radhakamal Mukerjee, *The Changing Face of Bengal*, Calcutta University Press, Calcutta, 1938, p. 70.

<sup>201</sup> ‘Northern Bengal Railway Survey’, *Proceedings of the Hon’ble the Lieutenant-Governor of Bengal during November 1872* (General Department), WBSA.

<sup>202</sup> From Colonel C. H. Dickens, R.A., Secretary to the Government of India, Public Works Department, to the Officiating Secretary to the Government of Bengal, General Department (Industry and Science). – (No. 1534S. – R., dated Simla, the 24th October 1872.), progs no. 42, *Proceedings of the Hon’ble the Lieutenant-Governor of Bengal during November 1872* (General Department), WBSA.

<sup>203</sup> F. W. Strong, *op. cit.*, p. 64.

<sup>204</sup> J. A. Vas, *Eastern Bengal and Assam District Gazetteers: Rangpur*, p. 70.

<sup>205</sup> L. S. S. O’Malley, *Bengal District Gazetteers: Murshidabad*, pp. 116-117.

<sup>206</sup> The first railway line in eastern Bengal was built on the floodplain of the Ganga, which, along with its numerous branches and tributaries, poured its waters into the Bay of Bengal. At the primary stage there seemed to be no outlets for the passing of water through the embankment on which this line was constructed. The necessity of constructing outlets through the embankment had been repeatedly exerted only when there was the occurrence of floods. About 2000 lineal feet of ‘opening’ were added between 1868 and 1885. After the floods of 1890, a further 400 feet were added. For details see Iftekhhar Iqbal, *The Bengal Delta: Ecology, State and Social Change, 1840-1943*, Palgrave Macmillan, U. K., 2010, p. 130.

<sup>207</sup> *Ibid.* The main line of the Eastern Bengal Railway was the line between Calcutta and present day Siliguri which spread across the Rajshahi plains, the natural slope of which was towards the east. *Ibid.*, p. 131.

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<sup>208</sup> W. N. Nelson, *Final Report on the Survey and Settlement Operations in the District of Rajshahi*, p. 8.

<sup>209</sup> Iftekhhar Iqbal, *op. cit.*, p. 131.

<sup>210</sup> It was estimated that the amount of stone used in ‘pitching’ these guide banks of sand and clay would fill a broad gauge train extending from Kolkata to Darjeeling, a distance of around 300 miles. On the left bank the approach was about 4 miles long and for 2000 feet of that length the approach had the unusual height of 50 feet above the surrounding area. On the right bank the approach was three miles long with the same characteristics. For more details see *Ibid.*, pp. 134-137.

<sup>211</sup> *Ibid.*, p. 136.

<sup>212</sup> For details see Amitabha Bhattachryya, *Meghnad Saha’s Paradoxical Story: Railways and the 1922 North Bengal Floods*, CSSP Electronic Working Paper Series, Paper No. 6, Jawaharlal Nehru University, Sept., 2015, pp. 1-10.

<sup>213</sup> P. C. Mahalanobis, *op. cit.*, p. 6.

<sup>214</sup> *The Bengal Embankment Manual*, p. 19.

<sup>215</sup> *Ibid.*, p. 29.

<sup>216</sup> W. W. Hunter, *A Statistical Account of Bengal, Vol. VIII: Districts of Rajshahi and Bogra*, p. 30.

<sup>217</sup> *Final Report on the Survey and Settlement Operations in the Jalpaiguri District, 1906-1916*, Bengal Secretariat Book Depot, Calcutta, 1919, p. 18.

<sup>218</sup> There was hardly any river which was not included in the river training programme. Tista, Chel, Diana, Rethi, Pagli and Sukti, Pana, Kaljani, and Rydak – all were ‘placed’ under the river training programme to fulfill the colonial interests.

<sup>219</sup> *Final Report on the Survey and Settlement Operations in the Jalpaiguri District, 1906-1916*, p. 19.

<sup>220</sup> W. W. Hunter, *A Statistical Account of Bengal, vol. X: Districts of Darjiling, and Jalpaiguri and State of Kuch Behar*, p. 394.

<sup>221</sup> *Ibid.*, p. 395.

<sup>222</sup> W. W. Hunter, *A Statistical Account of Bengal, Vol. VII: Districts of Malda, Rangpur and Dinajpur*, p. 31.

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<sup>223</sup> M. O. Carter, *Final Report on the Survey and Settlement Operations in the District of Malda, 1928-1935*, Bengal Government Press, Alipore, 1938, p. 34.

<sup>224</sup> *Ibid.*, p. 35.

<sup>225</sup> *Ibid.*

<sup>226</sup> W. W. Hunter, *A Statistical Account of Bengal, Vol. VII: Districts of Malda, Rangpur and Dinajpur*, p. 31.

<sup>227</sup> When the northern embankment was opened and the southern one closed, the water from the river Tangan was allowed to flow out in such a way that it could not be escaped to the south so that the middle-lying tract remained well covered with water. On the other hand, comparatively less water had been required in early transplantation period when the southern embankment was opened and the surplus water was sent back into the Tangan. As the soil became getting dry the northern embankment was again opened up, and this process continued at regular intervals until the crop was harvested.

<sup>228</sup> W. W. Hunter, *A Statistical Account of Bengal, Vol. IX: Districts of Murshedabad and Pabna*, p. 130.

<sup>229</sup> Rai Bijay Bihari Mukharji Bahadur, *Final Report on the Survey and Settlement Operations in the District of Murshedabad, 1924-1932*, Bengal Government Press, Alipore, 1938, p. 71.

<sup>230</sup> This was a Government embankment and by Act VI of 1873 was vested in Government and placed under the charge of the Collector and an Engineer. W. W. Hunter, *A Statistical Account of Bengal, Vol. IX: Districts of Murshedabad and Pabna*, pp. 133-134.

<sup>231</sup> *Final Report on the Survey and Settlement Operations in the District of Murshedabad, 1924-1932*, p. 74.

<sup>232</sup> Praveen Singh, Flood Control for North Bihar: An Environmental History from the 'Ground-Level' (1850-1954), in Deepak Kumar, Vinita Damodaran, and Rohan D'Souza (eds.), *The British Empire and the Natural World: Environmental Encounters in South Asia*, Oxford University Press, New Delhi, 2011, p. 164. Praveen Singh argues, 'colonial zamindars pushed vigorously for constructing private embankments to safeguard their lands and crops from possible damage from inundations.'

<sup>233</sup> Tirthankar Roy, *op. cit.*, p. 75.

<sup>234</sup> S. C. Majumdar, *Rivers of the Bengal Delta*, Calcutta University Press, Calcutta, 1942, p. 16.

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<sup>235</sup> S. C. Majumdar, *River Problems in Bengal*, (a paper read at the Symposium on January 9, 1938 and published on December 15, 1938), Vol. IV, No. 4, Calcutta, 1938, p. 448.

<sup>236</sup> For details see Sheila Zurbrigg, Did Starvation Protect from Malaria? Distinguishing between Severity and Lethality of Infectious Disease in Colonial India, *Social Science History*, Vol. 21, No. 1 (Spring, 1997), pp. 27-58.

<sup>237</sup> Sheldon Watts, 'British Development Policies and Malaria in India 1897–c.1929', *Past and Present* - 165, 1999, 141–81 and Ira Klein, 'Death in India: 1871–1921', *Journal of Asian Studies*, 32, 1973, 639–59.

<sup>238</sup> C. A. Bentley, *Malaria and Agriculture in Bengal: How to Reduce Malaria in Bengal by Irrigation*, Bengal Secretariat Book Depot, Calcutta, 1925, p. 6. The remarkable lessened occurrence of malaria in Eastern Bengal was due to the better health provided by the expansion and good culture of land use and agriculture which was prevailed in this part of country.

<sup>239</sup> C. A. Bentley, *op. cit.*, p. 26.

<sup>240</sup> *Ibid.*, p. 30.

<sup>241</sup> *Ibid.*, p. 37.

<sup>242</sup> *Ibid.*, p. xxiv.

<sup>243</sup> *Ibid.*, p. xxv.

<sup>244</sup> Arabinda Samanta, Crop, Climate and Malaria: Ecological Construction of an Epidemic in Colonial Bengal, *Economic and Political Weekly*, Vol. 36, No. 52, (Dec. 29, 2001 – January 4, 2002), p. 4887.

<sup>245</sup> For details see D. N. Ray, *Cholera and its Preventive and Curative Treatment*, A. L. Chatterton Publishing Company, New York, 1884.

<sup>246</sup> R. Pullitzer, Cholera, Monograph WHO, 1959 cited in Mercedes Pascual, Menno J. Bouma, and Andrew P. Dobson, Cholera and Climate: Revisiting the Quantitative Evidence, *Microbes and Infection* (4), 2002, p. 237.

<sup>247</sup> James L. Bryden, M. D., *Note on the Epidemic Connection of the Cholera of Madras and Bombay with the Cholera Epidemics of the Bengal Presidency*, Office of the Superintendent of the Government Printing, Calcutta, 1871, Proceedings of the Sanitary Commissioner with the Government of India, December 1871, p. 1.

<sup>248</sup> *Ibid.*, p. 2.

<sup>249</sup> *Ibid.*, p. 4.

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<sup>250</sup> H.W. Bellew, *The History of Cholera in India from 1862–81*, 1884, cited in Mercedes Pascual et al, op. cit., p. 237.

<sup>251</sup> Cited in Mercedes Pascual et al, op. cit., p. 238.

<sup>252</sup> David Arnold, Cholera and Colonialism in British India, *Past and Present*, No. 113, Nov., 1986, pp. 125-126.

<sup>253</sup> Leonard Rogers, The Forecasting and Control of Cholera Epidemics in India, *Journal of the Royal Society of Arts*, Vol. 75, No. 3874 (February 18th, 1927), pp. 323-324.

<sup>254</sup> *Ibid.*, pp. 324-325.

<sup>255</sup> Charles J. Jackson, *Report of the Sanitary Commissioner for Bengal, for the year 1871*, Central Press Company Ltd., Calcutta, 1873, p. 13.

<sup>256</sup> *Sixth Annual Report of the Darjeeling Circle of Vaccination, for the year 1871-72*, WBSA.

<sup>257</sup> F. W. Strong, *Eastern Bengal and Assam District Gazetteers: Dinajpur*, p. 47.

<sup>258</sup> At Porsa the ground water level was 33 feet down, and the spleen rate was only 28.3, the lowest met with, while the fever death rate of 29.05 per thousand was also the lowest of all the thanas. On the contrary, the highest ground water level coincided with the highest spleen and fever rates. Similarly Dinajpur, Birgunj and Thakurgaon thanas showed high ground water levels and spleen and fever rates, whereas Balurghat and Churaman had lower rates approaching those of Porsa. *Ibid.*, pp. 47-48.

<sup>259</sup> For details see Leonard Rogers, *Special Report on the Prevalence of Fevers in the Dinajpur District*, 1904, pp. 23-33.

<sup>260</sup> W. W. Hunter, *A Statistical Account of Bengal, Vol. X: Districts of Darjiling, and Jalpaiguri and State of Kuch Behar*, p. 321.

<sup>261</sup> John. F. Gruning, *Eastern Bengal and Assam District Gazetteers: Jalpaiguri*, p. 46. Jalpaiguri town, representing the western region was moderately malarious but across the Tista in the Duars the percentage of contagion had rapidly increased and reached its maximum point at Nagrakata.

<sup>262</sup> The types of malaria found in the district were – simple tertian, malignant tertian, quartan fever and the deadly black-water fever. Mixed infections and double infections of the same parasite often made it difficult to recognize the variety from the temperature chart. The cycle of simple tertian fever was 48 hours and the fever occurs every third day. The malignant tertian had a cycle of from 24 to 48 hours and the fever occurs every other day or more commonly daily. The quartan parasite had a cycle of 72 hours and the fever paroxysm appeared every fourth day.

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<sup>263</sup> Surgeon R. Lidderdale, M. D, *Sixth Annual Report of the Darjeeling Circle of Vaccination, for the year 1871-72*, Appendix No being No.1 of Medical Proceedings for October 1872, WBSA.

<sup>264</sup> *Ibid.*

<sup>265</sup> Cited in the *Final Report on the Survey and Settlement Operations in the Jalpaiguri District, 1906-1916*, p. 16.

<sup>266</sup> Dr. Bentley's investigation was, however, also directed towards the exploration and addition of knowledge in the preparation of the ongoing Gazetteer for the district during the opening years of the twentieth century. Though since the early days of British occupation, the *Terai* region was known to be a place of acute malarial activity, but it was not until the visit of the Royal Society's Malaria Commission in 1901 that anything really definite was known as to the actual incidence of malarial disease in this part of the country. The investigations conducted in this occasion by Drs. Stephens and Christophers and Captain S. P. James, I. M. S., showed that the malarial endemicity of the Duars was extraordinarily high and that black water fever was a common disease as it was in the Central Africa. John. F. Gruning, *Eastern Bengal and Assam District Gazetteers: Jalpaiguri*, p. 47.

<sup>267</sup> *Ibid.*, pp. 49-50.

<sup>268</sup> *Ibid.*, p. 52.

<sup>269</sup> *Final Report on the Survey and Settlement Operations in the Jalpaiguri District, 1906-1916*, pp. 16 – 17.

<sup>270</sup> Regarding the colonial concern for malarial prevalence in the Terai and Duars regions of north Bengal, Bhattacharya has argued that "The site of research assumed significance as a primary factor both in the identification of the causation of disease, as well as in the economic concerns of colonialism. Yet, this focus on specific localities in terms of research and economic activities did not extend to sustained implementation of anti-malarial policies at those very sites." Nandini Bhattacharya, *The Logic of Location: Malaria Research in Colonial India, Darjeeling and Duars, 1900–30*, *Medical History*, 55, 2011, p. 184.

<sup>271</sup> S. K. Niogi and Bhupendra Mohan Khan, *Winter Malaria Infection in the Bengal Dooars*, in *Records of the Malaria Survey of India, Vol. VII*, The Indian Research Fund Association, 1937, p. 218.

<sup>272</sup> John. F. Gruning, *Eastern Bengal and Assam District Gazetteers: Jalpaiguri*, p. 55.

<sup>273</sup> W. W. Hunter, *A Statistical Account of Bengal, Vol. VIII: Districts of Rajshahi and Bogra*, p. 122.

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<sup>274</sup> Charles J. Jackson, *Report of the Sanitary Commissioner for Bengal, for the year 1871*, p. 17.

<sup>275</sup> L. S. S. O'Malley, *Bengal District Gazetteers: Rajshahi*, p. 67.

<sup>276</sup> *Ibid.*, p. 68.

<sup>277</sup> W. N. Nelson, *Final Report on the Survey and Settlement Operations in the District of Rajshahi*, pp. 20-21.

<sup>278</sup> *Ibid.*, p. 21.

<sup>279</sup> W. W. Hunter, *A Statistical Account of Bengal, Vol. IX: Districts of Murshedabad and Pabna*, p. 133.

<sup>280</sup> J. N. Gupta, *District Gazetteers of Eastern Bengal and Assam: Bogra*, p. 52.

<sup>281</sup> Section- I On the State of the Public Health in British India, *Annual Report of the Public Health Commissioner with the Government of India for 1924*, p. 33.

<sup>282</sup> G. E. Lambourn, *op. cit.*, p. 27.

<sup>283</sup> Asim Kumar Sarkar, *Social, Economic and Political Transition of a Bengal District: Malda, 1876-1953*; Unpublished Ph. D thesis, University of North Bengal, 2010, p. 30.

<sup>284</sup> Hunter was of the opinion that the banks of the Mahadnanda and the large part of the land stretched between Mahananda and the Ganges with their favourable soil and climate were perhaps 'less obnoxious to disease than the average of Bengal' and for this reason there was no disease 'of a strictly endemic type' prevailed in the district of Malda. But the subsequent information provided by Hunter, however, contradicted his own argument of being 'less unhealthy' of the district because the district had fallen under severe attack of several diseases time to time. W. W. Hunter, *A Statistical Account of Bengal, Vol. VII: Districts of Malda, Rangpur and Dinajpur*, p. 145 and 146.

<sup>285</sup> For details see Digamber Mitter, *The Epidemic Fever in Bengal*. Reprinted from the *Hindoo Patriot*, 1876, *Preface*.

<sup>286</sup> G. E. Lambourn, *op. cit.*, p. 41.

<sup>287</sup> *Ibid.*, p. 40.

<sup>288</sup> During September, the disease prevailed in a mild form all over the district, but increased in virulence as the inundation subsided. The disease was severe in Gorgoriba *thana* in the north-west and Kliachuck in the south. Charles J. Jackson, *Report of the Sanitary Commissioner for Bengal, for the year 1871*, p.17.

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<sup>289</sup> *Sixth Annual Report of the Darjeeling Circle of Vaccination, for the year 1871-72*, WBSA.

<sup>290</sup> *Ibid.*, p. 42.

<sup>291</sup> C. A. Bentley, *Malaria and Agriculture in Bengal*, p. 50.

<sup>292</sup> *Ibid.*, p. 36.

<sup>293</sup> J. A. Vas, *Eastern Bengal and Assam District Gazetteers: Rangpur*, p. 49. For the district of Rangpur, average mortality was highest in 1909, when the rainfall was most abundant. During the first decade of the twentieth century drainage system had been improving as a result of government initiative which successfully checked the mortality rate and provided a better condition for the Rangpur town than the other parts of the district. Despite of these, malarial mortality did continue in some parts of the district very frequently and appeared sometime with an unprecedented severity.

<sup>294</sup> Arthur Coulton Hartley, *Final Report of the Rangpur Survey and Settlement Operations, 1931-1938*, Bengal Government Press, Alipore, 1940, p. 8.

<sup>295</sup> The fever death-rate in the decade from 1893 to 1902 stood at 28.6 per mile, in the quinquennium from 1900 to 1904 it was 29 per mile, and in the succeeding quinquennium it rose further to 30.6 per mile. J. A. Vas, *Eastern Bengal and Assam District Gazetteers: Rangpur*, p. 51.

<sup>296</sup> *Sixth Annual Report of the Darjeeling Circle of Vaccination, for the year 1871-72*, WBSA.

<sup>297</sup> *Forty-eighth Annual Report of the Sanitary Commissioner for Bengal 1915*, WBSA, pp. 8-9.

<sup>298</sup> The death rate was constantly changing. 1911-20 – 31.59; 1921-30 – 27.00; 1931- 25.23; 1932 – 20.72; 1933 – 28.05; 1934 – 27.11; 1935 – 27.55. *Final Report of the Rangpur Survey and Settlement Operations, 1931-1938*, p. 7.

<sup>299</sup> *Final Report of the Rangpur Survey and Settlement Operations, 1931-1938*, p. 8.

<sup>300</sup> This condition was noticeable in the districts of Burdwan, Hoogly, Nadia, Jessore, Murshidabad, and in a few parts of the Dacca and Rajshahi Divisions. C. A. Bentley, *op. cit.*, p. xxxix.

<sup>301</sup> Cited in *Ibid.*, Appendix. V, p. xlvi.

<sup>302</sup> David B. Smith, *Annual Report of the Sanitary Commissioner for Bengal for the year 1870-71*, Bengal Secretariat Press, Calcutta, 1872, p. 1.

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<sup>303</sup> “Special Cholera Report” in *The Annual Administration Report of the Cooch Behar State for the year 1887-88*, Cooch Behar State Press, Cooch Behar, 1889, p. 26.

<sup>304</sup> *Ibid.*

<sup>305</sup> *The Annual Administration Report of the Cooch Behar State for the year 1887-88*, p. 26.

<sup>306</sup> Annual Administration Report of the Department of General Administration and Criminal Justice of the Cooch Behar State for the year 1906-1907 in *The Annual Administration Report of the Cooch Behar State for the year 1906-07*, p. 24.

<sup>307</sup> The people of the State also suffered heavily from severe attacks of Influenza in 1918-19 which caused deaths of 637 persons throughout the State out of a total number of 1320 attacks. Report of the Vice-President, State Council in *The Annual Administration Report of the Cooch Behar State for the year 1918-1919*, p. 13.

<sup>308</sup> *The Annual Administration Report of the Cooch Behar State for the year 1934-35*, Cooch Behar State Press, Cooch Behar, 1935, p. 92-93.

<sup>309</sup> *Ibid.*

<sup>310</sup> Cited in Christopher V. Hill, *Water and Power: Riparian Legislation and Agrarian Control in Colonial Bengal*, *Environmental History Review*, Vol. 14, No. 4 (Winter, 1990), p. 16.

<sup>311</sup> *Report on the Administration of Bengal, 1922-23*, Bengal Secretariat Book Depot, Calcutta, p. 95.

<sup>312</sup> Government of Bengal, *Report of the Land Revenue Commission, Bengal, Vol. VI*, Bengal Government Press, Alipore, 1940, cited in Christopher V. Hill, *Water and Power...*, p. 16.

<sup>313</sup> *Report of the Irrigation Department Committee 1930*, Government of Bengal: Irrigation Department, Bengal Secretariat Book Depot, Calcutta, 1930, p. 6.

<sup>314</sup> *Ibid.*, p. 9.

<sup>315</sup> ‘The Work of the Irrigation Depart’, *Report of the Irrigation Department Committee 1930*, p. 8.

<sup>316</sup> William Wilcocks, *Lectures on the Ancient System of Irrigation in Bengal and its Application to Modern Problems*, University of Calcutta, Calcutta, 1930, pp. 29-30.

<sup>317</sup> Christopher V. Hill, *Water and Power...*, p. 2.

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<sup>318</sup> Kuntala Lahiri-Dutt, *Imagining Rivers*, *Economic and Political Weekly*, Vol. 35, No. 27 (Jul. 1-7, 2000), p. 2395.

<sup>319</sup> Rohan D'Souza, *Water in British India: The Making of a Colonial Hydrology*, *History Compass* 4/4 (2006), p. 624, 10.1111/j.1478-0542.2006.00336.x.

<sup>320</sup> For the present day problem of floods Misra has talked about the control of floods in the local level and in doing so 'people's science and technology' will be the chief instruments. This is equally applicable for the colonial India where none of these measures were practically understood neither these kind of initiatives had been taken by the colonizers who 'understood the people's wisdom but only after destroying it.' Dinesh Kumar Mishra, 'Living with Floods: People's Perspective', *Economic and Political Weekly*, Vol. 36, No. 29 (Jul. 21-27, 2001), p. 2756 and 2757.

<sup>321</sup> The Himalayan mountains are not only intensely liable to the severe cyclones and hailstorms but many of the devastating earthquakes had been taken place since its creation. The mountains had already witnessed great floods brought by its river due to the melting of snow or excessive rainfall in the hills. Thus deforestation or afforestation, as argued, does not alter the situation in any comprehensive manner. For details see B. D. Dhawan, 'Coping with Floods in Himalayan Rivers,' *Economic and Political Weekly*, Vol. 28, No. 18 (May 1, 1993), pp. 850.