Chapter II

Cyclone, Society and Economy: Disaster and Damage in Northern Bengal (1864-1899)

Cyclones had brought great damage and destructions to the society and economy of northern Bengal during the nineteenth century. A tropical country like India is acutely susceptible to the occurrence of storms. Wind circulation and solar radiation above the Bay of Bengal had acted as the main catalyst for the creation of cyclonic storms. The recent definition or characteristic of cyclone is pertinent to note here. According to the *International Perspectives of Natural Disasters*: 'Tropical storms have wind speeds in the range of 18 to 32 meters per second. When the wind speeds exceed 32 meters per second, the system is called a severe tropical storm, and the names cyclone, typhoon, or hurricane are used.'[1] However, the first 'recorded' storm in the Indian Ocean which was accompanied by an earthquake and *tsunami* took place on October 11, 1737.[2] A historical study of Cyclone of a specific region (Bengal or especially northern Bengal) would unfold the so far unearthed terrain of meteorological development towards a better understanding of cyclonic occurrences and to the mitigation of hazard. But Government or State system seems to be the deciding factor in terms of production of knowledge and lessening of suffering.[3] This chapter, however, focuses on the occurrences, spread and effects of the cyclones from 1864 to 1899, many of which had originated in the Bay of Bengal and travelled to the northern districts of Bengal and few were caused by local depressions, on society and economy of northern Bengal and side by side examines the genesis and dissemination of meteorological knowledge during the second half of the nineteenth century.

Storms and cyclones made time to time visit to the different districts of this region accompanied by heavy rainfall and wind of great force. From the month of November to May upper winds over the Himalayan region are predominantly westerly. Nonetheless, Cyclones did not restrict to

these months but appeared in a more violent form in many times of the year. The districts of northern Bengal frequently fell under violent gale between 1864 and 1899 (with other parts of Bengal or sometime exclusively). The cyclones under the period of study whether came from the Bay of Bengal or having regional origin did not confine themselves to their origin, in fact, northern part of Bengal as well as other parts of Bengal were also hit by these cyclones. Cyclones had very often accompanied with heavy rains which had contributed to rising water level in the rivers that endanger the possibilities of floods. Official reports of several government departments had not only contradicted with each other but produced ambiguous information from which any uniform deduction could hardly be drawn. Any historical attempt on the part of the historians to decipher cyclonic impact upon human lives, settlement and society in this part of Bengal is still awaited. The sufferings caused by the cyclonic disasters, and destructions it brought about need to be spell out separately and distinctively for the northern districts so far the varied nature of meteorological information about the cyclones for different areas and subsequent government reliefs are concerned.

The Cyclone of October 1864

During the second half of the nineteenth century cyclonic appearances in Bengal became more frequent than the earlier times. The cyclone of October, 1864 deserves to have the foremost mentioning among the cyclone narratives. The cyclone had commenced to the north-west of the Andamans on October 2nd and ultimately it reached to the Lower Assam on the afternoon of the 7th October. The records for the cyclone had largely been obtained from the copies of a ship's logs which started to record the accounts of wind movements along with barometer readings three to four days preceding to the cyclone from the observatories of Ceylon, Madras, Port Blair, and Calcutta and of very few other stations of Bengal.[4] The '*Report on the Calcutta Cyclone of the 5th October 1864*', written by Lieut. Col. J. E. Gastrell and Henry F. Blanford remained one of the major sources of information on the 1864 cyclone. In the Bay of Bengal and the outlying

northern parts of the sea southerly winds were started blow from the 1st October which gradually proceeded to the northern side, but data on wind pressure was only recorded at the stations of Kandy, Madras, Calcutta and Agra.[5] Apart from the ship's logs, among the several land stations like Kandy, Madras, Calcutta, and Agra and so on, for the northern districts of Bengal the information was collected from the observatories of Rampur-Boalia (in the district of Rajshahi) by Dr. P. F. Bellew and of Darjeeling by Dr. B. Simpson.

The first appearance of the cyclone was experienced by a ship, namely *Moneka*, on 1st October, which recorded: "dark, rainy, squally weather, and west to west-south winds – with a low Barometer and with a heavy swell from the south south-west" and for 2nd October, in the afternoon, it reported that the sky "looked very black and lowering and a high rolling sea came down from that quarter, rising very quickly.[6]

Table. 2.1:

Barometer and Thermometer Reading and Wind Direction on the 2nd October

Land Stations	Barometer	Thermometer	Wind	Remarks
Kandy (altitude 1,560 feet)	28.332b	71.4	SW	Mean of day
Singapore (altitude 50 feet)	29.99c	83	……..	Bar. 9 a.m. Therm. mean of maximum and minimum.
Port Blair (sea level)	29.823b	87	SW	Noon observation
Madras	29.847b	82.8	N by E.	Mean of day
Calcutta (altitude 18 feet)	No observations		……	,, ,,
Rampore-Beauleah	29.822c	85	E.	,, ,,
Darjeeling (7, 169 feet)	…….	61	SW	,, ,,

Source: Extracted from the '*Report on the Calcutta Cyclone of the 5th October 1864*', p. 10.

From the above table it thus can be noticed that the cyclone coming down rapidly from northward direction had formulated by the noon of the 2nd October and this was confirmed from the observation of *Moneka* and Port Blair. The *Conflict* and *Golden Horn* were another two ships situated at the Bay of Bengal which also recorded the emerging cyclone. The logs of the *Golden Horn* narrated the appearance of the cyclone in the following manner:

> "Sunday, October 2nd, 1864, - A. M. Winds light from north-west to west, with heavy appearance; vivid lightning and squalls with deluge of rain, each squall getting heavier…. Forenoon; double reefed the topsails. P. M. Winds north-easterly…… Later part of the day and night, strong breeze and deluge of rain."[7]

However, for the 2nd October no data had been obtained for any station between Port Blair and Chittagong. On the 3rd October a significant change had taken place in the Meteorology of Bengal and the northern part of the Bay. The northerly force which was situating only in Eastern Bengal gradually dispersed itself nearly whole of the meteorological stations and extended far down the western part of the Bay.[8] The change in the temperature though was very minimal but could be noticeable. At Cuttack, the Sand Heads, and Darjeeling there is a fall of 1º from the mean of the previous day, and at Calcutta of 1º since the 1st; and at Rampur-Boalia (District *Sadar* of the Rajshahi District) the mean fall since the 2nd October was 2º, and 3º since the 1st.[9] On the 4th October, a ship named *Proserpine* when crossing the head of the Bay with a distance of 180 miles from the centre of the cyclone "experienced very heavy weather from the recurrent southerly wind current, which was, ….., the chief cause and feeder of the Cyclone".[10] The general conclusion regarding the appearance of the cyclone which was noted at the report had suggested that the cyclone was mainly derived from a stormy current "originally from the west south-west and south-west, which was felt in Ceylon and Port Blair on the last two or three days of September, and began to curve in to the Cyclone on the 2nd October" and on the 3rd October it was blowing with a second storm of about 280 miles to the north-west of the Andamans and 'advanced at an average speed of 10 miles an hour ……..at midnight on the 4th, whence the storm continued its destructive course over Lower Bengal'.[11]

C. E. Buckland mentioned that "According to the observations at the Meteorological Observatory, the wind which had been blowing from N. E. suddenly veered at 9 a.m. to E. raging

very strongly and in great gusts, varying in pressure from 5 to 32 lbs. per square foot, till about 2 p.m., when the wind shifted to S. E. The gale was accompanied by heavy driving rain. At 11 a.m. the barometer stood at 29.46 inches, gradually and continuously descended to 28.80 inches at 2 p.m. and rose at 6 p.m. to 29.66 inches."[12] In Rampur-Boalia the cyclone reached with its full force on 5th October. Mr. Blechynden recorded the detail changes observed in the Barometer and Thermometer and jotted down the hourly description of the cyclone in terms of wind-force and direction, changes in temperature and rain etc.:

> "October 5th. ---- 7 a.m. cloudy, with wind from north-east; - 10 a.m. cloudy and drizzling; wind from north-east; - 1 a.m. clouds flying low, showers off and on; wind north-east and blowing stronger; 2 p.m. blowing stronger; ……and indications of bad weather, Thermometer 84º; Barometer 29.40; - 4 p.m. wind on the increase,…..6 p.m. blowing strong and in gusts; more rain……8 p.m. wind very much increased and the gusts stronger…direction of wind north-east by north; 9 p.m. blowing a strongish gale; gusts at time very severe; Thermometer 78º; Barometer 29.27;…..10 p.m. blowing a perfect gale; wind in severe gusts accompanied by a sound like distant thunder;….trees beginning to fall; Thermometer 75º; Barometer 29.20; - 11 p.m. a very severe gale, blowing steadily,….very severe gusts;…Thermometer 72º, Barometer 29.15.
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> October 6th. ---- 12 midnight, gale at its highest, no walking against the wind, …Trees falling and branches being knocked off; raining hard, Thermometer 72º, Barometer 29.00; ….. 2 a.m. wind due north-west,….steady blow very strong…….3 a.m. still blowing hard, but not so severe; rain freer; Thermometer 72º, Barometer 29.3; from which time the gale abated, and at 10 a.m. there was sunshine, and wind south-west."[13]

The above account had provided vivid description of the cyclonic occurrence in Rampur Boalia and as it is apparent the wind was gradually turning from the north-east direction to the north (5th. Oct.) then north-west and finally to the south-west (6th. Oct.) and the Thermometer showed a continuous decline from 84º to 72º. The continuous flow of hard wind for more than one and a half day had resulted into the destruction of trees.

But other accounts did vary from the above description. The Executive Engineer of Rajshahi had reported the following narrative:

> "…… On the morning of the 5th the atmosphere was misty, and by 10 o'clock rain began to fall, and continued throughout the day, not very heavily, but driven by a strong north wind, the first which had blown from that quarter during the previous nine months. At 7 p.m. the wind veered to the north-east, and increase in violence; by 10h. 30m. p.m. it was from the north, and blowing very strongly. It continued thus till 2 a.m. (on the 6th,) when the wind

> shifted to the north-west, and the violence somewhat diminished, and by 6h 30m. a.m. it was coming from due west, and with a few irregular puffs the storm subsided."[14]

One probable cause of the variation between these two accounts was that the direction of wind and the time of the beginning of rainfall had varied in different stations. On the other hand, the later narratives could not provide any thermometer and barometer data and depicted the cyclonic occurrence with having a long gap of duration of time between which rainfall, temperature and wind direction were not only varied but also contradicted. As a result of the cyclone a number of trees and native huts were blown down, and in the town of Rampur one *pucca* house and 200 *cutcha* houses were demolished and one man was killed. Despite of being in the equal distance from the central tract of the cyclone Rampur Boalia was more affected than Berhampur.[15]

Nator of Rajshahi District was also severely hit by the cyclone. Data collected and reported from Singra, Boraigaon, and other places of Nator had varied in regards to the wind direction, the times in the changes of the storm. But it was deducted from the available information, although remained contradictory, that the centre of the cyclone had passed over Nator. The Police report asserted that "The cyclone commenced about 7 o'clock on the evening of the 5th October, and lasted till 3o'clock in the morning. The wind blew from the north-east [till] about midnight, [when] there was a lull, and then the wind shifted to the north-west, blowing as hard as ever……. During the storm a brilliant meteor was seen."[16] On the other hand, the report of the Executive Engineer, though not being of an eye witness's report, mentioned that from 7 p.m. the wind was blowing from the south whereas the lull in the storm was lasted from 10 to 11 p.m. and occurred after an unexpected turn of the wind to south-west.[17] However, at Boraigaon the cyclone was started at 8 o'clock while in Singra the 'height of the storm' was lasted between 3 o'clock and 12 at the midnight. Moreover, Mr. F. Grant while travelling in a boat on the river from 15 miles north-east of Nator experienced that "….. The wind gradually increased, and from about 9 to 11 p.m. it blew a perfect hurricane. The direction of the wind……was north-east. About 11 o'clock there was a perfect lull, after which it again commenced to blow with greater violence than ever. This time the direction of the wind was north-west.[18] Thus the available narratives had shown that different parts of the Rajshahi district were affected by the cyclone which was changing its direction gradually and appeared these areas in varied times having

varied degree of force of wind and rain. The information provided by the officials or other persons had sometime differed from each other but were equally useful, although subject to the proper enquiry and corroboration from other sources and scientific explanation, for the construction of the account of cyclone.

The account for the district of Bogra was interesting enough to note here. C. E. Buckland mentioned that the storm cutting across the Ganges between Rampur Boalia and Pabna, flounced the whole of the Bogra district, and rounded to the eastward when it had reached 25° N., after which it expended in the Garo hills.[19] According to a correspondent of the Englishman newspaper the morning of the 5th October was accompanied with a mild rain and strong eastward breeze and the wind was gradually taking southward turn with a form of a violent squall which was increasingly expanded to a violent cyclone in the midnight along with heavy rain and finally went to the westward direction.[20] Dr. Tylers account told us that:

> "On the 5th, rain; wind still from north-east, increasing from noon until it became a gale at 9 p.m., and continued to blow with increasing violence up to midnight, when there was a sudden lull about a quarter of past 12 for about 20 minutes, and the wind veered round by south to south-west, and from this point blew as fiercely nearly as before for about two hours; gradually changing to the west and subsiding about 4 a.m. of the 6th."[21]

Describing the condition in Bogra, Assistant Superintendent of Bogra had wrote to the Deputy Inspector –General of Police that:

> "the storm when was its climax, viz., about 2 a.m. was decidedly from East to North-East; as I can testify by the effect on my house, also by the directions in which all the trees have fallen. Yesterday afternoon heavy squalls of wind accompanied by rain swept across the country and continued to increase in intensity during the whole afternoon. The wind was first from the East and gradually chopped round to the West by sun-set when began the full fury of the storm."[22]

Apart from the minor scribbles in the above mentioned accounts for the cyclone, on the whole, they narrated the appearance and spread of the cyclone in the district of Bogra which devastated the region on 5th October, 1864. But it was difficult to find out the exact course of the cyclone in this district due to its sudden change in direction. Although it was somehow identified that the centre of the cyclone was over Nator and Singra of the Rajshahi District but at the same time

there was prevailing anticipation of having more than one vortex of the wind. The passing of the wind from one district to another was so diversely directed that it became problematic to allow any concrete identification about not only the wind-direction but also the visiting-time of the storm in a particular area. The, rain that the cyclone brought out, due to its excessive quantity had resulted in high floods in the eastern *thanas* of Bogra.[23]

Looking at the district of Pabna the situation appears quite different. Different parts of the district of Pabna were also hit by the 'hurricane' of 5th October.[24] Dadupur, Pabna, Jhenai River, Jamalpur were the worst affected parts of the district. Mr. J. Parker had reported from Pabna that:

> "…, the 5th, …rain accompanied by strong wind from the east, which continued …till 6 in the evening, when the wind increased. At 7 a.m. it was blowing a perfect gale from the south-east, and continued to increase in violence till between 10 and 11, when it was at the highest…a portion of the pucka work of y house fell, and the whole of the kutcha out-houses and trees were leveled to the ground.., and at midnight the gale was considerably over:…"[25]

Though Mr. Parker was said to inform by his family about an occurrence of earthquake on the day of cyclone but it was not supported by any other sources. At Dadupur, though rain was started from the night of the 4th but the morning of the 5th brought about excessive rain, and gusting storm was increasing throughout the day which was blowing initially from the east and hastily approached towards the south with unprecedented force and finally stopped in the morning of the 6th. In addition with these, the cyclone produced raging fire which was caused by the meteors in a form of lightening in the sky. Captain Graham while travelling on a boat in the Jhenai River had experienced the storm and provided a 'graphic description of the light' which accompanied the storm. He thus stated that:

> "….I first observed a pale, bright light, on almost a level with the horizon. This light,.., accompanied the wind round to the north-west, where it stopped, and again began to move to the north-east. Thence it went round with the wind to the east and south-east, being sometimes high and sometimes low in the heavens, and finally, at about 1 o'clock on the morning of the 6th, it broke out with great splendour in the south-west, lighting up the whole sky, and appearing like the sun breaking through murky clouds at mid-day. The country was partly lit up, and I thought the day had broken, but after about half an hour the light disappeared, and left everything as dark as ever."[26]

Though the light was seen from Calcutta and few of its surrounding northern districts, but this sort of electrical occurrence did not appear in the outskirts of the cyclonic zone i.e. Dacca, Chittagong etc. which were left by the light so surprisingly. Jamalpur was also visited by this 'luminous appearance' and this was noticed by a large number of people residing there. In Jamalpur, the light appeared to be more interesting than the earlier. 'During the height of the storm, curious lights were seen of two sorts, viz., balls of fire, two or three or more together, floating about and settling on the trees; and distant glares like villages burning, or day break.'[27] The negative electricity of the atmosphere during rainfall was probably due to the friction of the falling of the rain drops and this was caused by the production of the enormous friction of the wind-borne rain against terrestrial objects which seemed to be a powerful generator of electricity.[28]

After crossing Bogra the storm went westward towards the Garro Hills. Rangpur, Dinajpur and western side of Brahmaputra were also visited by the storm, though in a different way from the other areas. Mr. Wavell had mentioned in his letter that at Bugwah on the Brahmaputra (on the east of Rangpur) the wind had been much strong and at Cooch Behar, as Colonel Haughton reported, some boats were went down into the river. Wavell went on to say:

> "[The storm] was stronger at Sadoolpoor ……. [and] at Peergunj .., and at Bagdwar…..the wind did a great deal of damage to houses and trees: ….. the storm would appear to have been more severe than in any other part of the district….and at Dinajpore, it was only a strong wind. At Julpigoree it was not at all severe."[29]

At Darjeeling the wind was south-westerly on the 1st and 2nd October. On 3rd and 4th October the wind was gradually from east whereas it turned to the north-east on 5th and the temperature fell two or three degrees with this north-easterly wind.[30]

The cyclone had brought about a large scale destruction of lives and property in many parts of Bengal. Buckland had summarized the impact of the cyclone in the following words:

> "The Government buildings sustained severe damage. The distress and suffering to which the survivors in the affected tracts were exposed after the disaster were very great. For several days food was not obtainable, the local stores .had been swept away, and relief could not be sent from Calcutta. In some places, a kind of grass was eaten as food, and at others

which escaped the storm-wave the stores of the rice merchants were broken open and plundered."[31]

However, there seemed to be varied nature of destruction in the affected areas during the cyclonic days. The estimate and extent of damage was accounted by the Government from the reports of the Commissioners, Magistrates and Assistants, and Police Officers of different divisions and districts. Mr. A. B. Falcon, EsQ., Officiating Magistrate of Bogra wrote to the Commissioner of the Rajshahi Division that "a gale from the North-East occurred last night [5th Oct.], which was done much mischief. The Jail is nearly in ruins. The Police Lines are down; several boats are stranded; many trees have been blown down, and many houses in the Town; and one or two lives have been lost. The river is higher than it has been many years…" [32] The Assistant Superintendent of Bograh had reported to the Deputy Inspector –General of Police that "The strength of the wind, coupled with great fall of rain, have the effect of laying nearly the whole of the Town in a mass of ruins, &c., &c. The Jail of the place which also is (or rather was) a mud collection of buildings, one-half has been rendered quite untenable."[33] Twelve deaths were reported from the Bogra Town and the total number of deaths, as was reported from different *thanas*, in the Rajshahi District was 147.[34]In Pabna, the cyclone caused severe destruction of houses and trees and many of the Government buildings were entirely damaged.[35]

Cyclone of 1st— 2nd November 1867

A severe storm during the night of the 1st November and morning of the 2nd November 1867 had struck again Bengal. The storm had its origin seemingly at some point in the North East portion of the Bay of Bengal, and the centre of the cyclone, as it was determined, had passed through the East of Saugor Point (24 Parganas), from the opening of the Matla River over Port Canning and Basirhat, and then it took northern North Eastern direction to the east of Kumarkhali and the west of Sirajganj.[36] The northern part of the Ganges was again affected by

the cyclone though it was varied from district to district, since all the northern Bengal districts was not equally hit by the wave of the cyclone equally.

W. Wavell, the Officiating Collector of Bogra had described that: *"*On the 1st the fall was heavier… During the night of the 1st and 2nd the wind increased.. In the morning it was still …heavy rain being driven before it, it looked very much ……..as after temporary lulls gusts of great force would come and there….This went on till about noon ….the three days was nearly 11 inches, and this combined with the...amount of injury everywhere…."[37] However, the earlier rain before the beginning of the cyclone, as Wavell was of the opinion, 'did far more good than harm and all was looked well' until when from the 30th October the day became warmer and on the 1st the cyclone appeared with heavy rains before the sunrise .[38] The outer edge of the cyclone was passed over the district of Dinajpur from the south-eastern part of the district to the south which was blowing from the direction of west to east.[39] Since the cyclone appeared in the district with only 'an ordinary gale of wind' there was no destruction of life though a few houses towards the southern boundary were said to have fallen.[40] The rice crop was underwent through the damage 'very slightly, perhaps 2 annas in the 16, but only towards the south and south-east of the district.'[41] It was opined that 'there [was] no necessity to set on foot relief measures.'

The impact of the cyclone in the district of Rajshahi was mixed with heavy damage and small scale destruction in different parts of the district. The Deputy Collector of Rajshahi district had initiated enquiries about the extent of damage in the countryside of the district. The *thana* named Singra which was situated to the east of the district had to suffer considerable damage. Mr. Humphery, the Collector of the district of Rajshahi had narrated the visitation of the cyclone in his district.

> "With regard to the cyclone itself, during the whole of Friday, the 1st of November, there was slight rain and a gusty wind; about 5 p.m. it cleared partially, but at about 7 p.m. it began to rain and a breeze sprang up which steadily increased until 3 p.m., when it reached its height it continued to blow with considerable violence until about 6 a.m. when it gradually moderated; and subsided entirely at 2 p.m. There was a good deal of thunder from 10 p.m. to 8 a.m., but distant, and no lightning visible; there was heavy drifting in the whole time and at the height of the gale the wind was intensely cold."[42]

Although in the interior there was no considerable amount of destruction but 'only a few trees have been blown down, and some kutcha houses knocked over these were nearly all uninhabited,..'. [43] However, a large number of cattle were destroyed in the storm in the interior. Though the cyclone had caused less damaged this time in the district than that was in 1864 but Nator was equally hit by this storm even in this time which caused 'damage to nearly every house in the town…and trees have been blown down, and a few cattle killed thereby.'[44] Despite of these, however, it was suggested that there was no necessity of Government help since in the town no *pucca* house had been injured. But on the basis of more authentic and reliable sources it was continuously assumed to have been identified that from Nator and Singra 'only bad accounts' had been furnished. So far the mixed effect of the cyclone in the district was concerned it can thus be noticed that, as narrated by the Deputy Magistrate and Collector of Rajshahi:

> "...no serious damage had been done in the neighbourhood of Beauleah, and ….for Nattore and Singrah, the most eastern part of the district,…received the only bad accounts.…travelling down the Burral, as the roads were too cut up by the inundation, to enable us to ride at any pace,…All along our route … we noticed the crops were good; and if injured at all, the damage must have been slight, as it was not perceptible. At Nattore very few huts have been fallen, the bamboo posts of which have probably never been attended to since the inundation which invariably rots all the portions buried in the ground; but with this exception no damage appeared to have been sustained and … was remarkably little sickness, no cholera; and …. very few cases of fever or dysentery. … the Chullun Bheel at Besaghat, a village on its border, … the very fragile sheds knocked down. The dhan [paddy], however, had suffered in exposed and high places, the grain having been whipped out and thinned by the force of the wind."[45]

The district of Rajshahi had again fallen under the cyclonic attack in 9th and 10th June of 1869. The damage done by the storm had been extensive in several parts of the Rajshahi town, many mat houses had fallen down and numerous fruit trees were injured.[46] But the destruction of houses especially 'the native houses' caused by the cyclone had always been regarded by the Government as a 'usual' phenomenon.[47].

In 1867, in the district of Pabna the cyclone seemed to have appeared in a different way and its influences had been manifested in a different manner. The Collector of Pabna had narrated the appearance of the storm in the district with a high easterly wind that had been felt for two days

"coming in gusts till the evening of 1st November, when it increased in steadiness and strength. The wind continued easterly, occasionally veering to south but more often to north-east, opinions, however, differ very much. From 12 at night to 5 a.m. the storm was at its height, the wind blowing fiercely from the north-east, the storm was accompanied by a deep booming noise."[48] The Sub-Divisional Officer of Sirajganj had mentioned that from the regular change in the direction of the wind it could be asserted that the storm was of a circular nature and the directions of the wind seemed to indicate that the centre passed in a curve somewhere to the east of Sirajganj and gradually through south to west.[49] It was reported by an officer from Kumarkhali who was of the opinion that

> "….it retained almost incessantly during the 1st November, and that the storm commenced with a booming noise from north-east by east between 12 p.m. and 1 a.m. of that night the gale was accompanied by very heavy rain towards dawn the north-easterly wind changed to squalls from different directions; between 5 and 6 a.m. the gale appeared to moderate; about 6 ½ a.m. there was a lull for an hour, when it blew for a short time from the north-west and then gradually subsided."[50]

The cyclone had appeared in the district of Pabna with a news of loss of life of a women due to the falling of her house and at 'Sirajganj lives were lost, (one from exposure) while at the Sudder one or two cases have been alone heard of'.[51] There was considerable injury that had been done to property, everywhere thatched houses and huts have greatly suffered, scarcely one anywhere escaping from damage, and more than half having been blown down.[52] The greatest loss in property had been sustained by merchants and others, who were forwarding goods by rivers to other parts. Hardly any boat of any kind was able in the larger rivers to ride out so severe gale, and the boatmen had saved their own lives by abandoning their boats.[53] Mr. McWilliam had given 'the marginally noted' estimate of the losses in the Kole and near Sirajganj. The Deputy Magistrate of Kumarkhali had estimated the loss of the *mahajans* to be about one lakh of Rupees.

Lost on the Kole

Paddy – 1,500 Mds.	Aniseed – 25 Mds.
Rice - 1, 750 Mds.	Cloth – 30 Mds.

Mustard – 3, 500 Mds.	Goor – 500 Mds.
Jute – 26, 570 Mds.	Grains – 500 Mds.
Tobacco – 300 Mds.	Sugar – 500 Mds.
Salt – 3, 500 Mds.	Oil – 200 Mds.
Cotton – 500 Mds.	

Lost within two or three days' journey of the place

Rice	1,000 or 1, 500 Mds.	Jute	20, 000 Mds.
Mustard	2,000 or 2,500 Mds.	Salt	15, 000Mds.

Source: *Progs. of the Lieut. Governor of Bengal during April, 1868 (General Department). Progs. No. 111,* WBSA.

Nevertheless, the loss of property and commodities in Kole and Sirajganj was in no sense 'marginal' but the amount was underestimated by the observer. On the other hand, the information had varied in the accounts provided by the officials in time to time. W. Le F. Robinson, Officiating Commissioner of the Rajshahi Division had mentioned that "in the greater part of this Division (Rajshahi Division) viz. Moorshedabad, Maldah, Dinagepore, Rungpore, Bograh, and Rajshahye, there was nothing which could be called a cyclone; …; a few huts and trees were blown down here and there, but there was no real damage done..."[54] It was reported by Robinson that the only places in fact where the storm was felt with degree of severity were Pubna and the sub-divisions of Sirajganj and Kumarkhali and the damages done to the huts, boats or places would not require any special relief. Most interestingly, Robinson had designated the occurrence of the storm 'as a god send' which had provided opportunities to the poorest classes of coolies, 'as they would find ample employment in repairing the houses of their better-of neighbours.'[55] However, the cyclone did not cause, as argued by Robinson, any considerable amount of loss of human life (one woman in Kumarkhali, three persons in Sirajganj, and one or two cases in Pubna!) and the number of loss of cattle was also very few that 'the actual amount was not ascertained.'[56] It was further asserted that the general health throughout the Division was

good and though there was an outbreak of cholera in Rajshahi, but 'it was not supposed to be connected in any way with the cyclone.'[57]

It can be noticed here that the reports which were sent by the Commissioners or Magistrates had not only varied widely from each other but also contradicted. So far the varied condition in the affected districts of the Rajshahi Division was concerned, the Commissioner of the Division was said to have been convinced from the reports that there was no necessity anywhere in the Division for taking action so far as the cyclone is concerned. The sinking of boats at Sirajganj and Kumarkhali had been identified by the Government as usual 'that must always happen in a gale of mind' and even going further it was reported that 'the gale which appears nowhere to have attained the proportions of a cyclone.'[58] Despite of these, on the basis of the report from the Collector of Bogra it was declared that, for Bogra, 'the damage done by the laying of the crops would be fully compensated for by the improvement in those parts which were backward'; and for Pabna, since there was 'no special report' received so it could be assumed that 'no special damage ha[d] been done there'. [59] However, the worst affected part of Bengal by the cyclone was the districts of Presidency Division (e.g. 24 Parganas, Jessore and Nuddea) where loss and destruction in terms of life, cattle and houses were amounted to maximum (total number of loss of life, cattle and destroyed houses were 3,934; 60,609; and 8,12,403 respectively in the three districts) and a considerable damage was done to the crops.[60]

Cyclone of 20th September 1872

Several parts of Bengal were affected by the cyclone of 20th September 1872. The wave of the storm went northward upto Tura after traversing the southern part. In fact, many parts were hit simultaneously by the cyclone in the similar time. Among the northern districts of Bengal, the cyclone was severely felt in the districts of Pabna, Bogra, and Rajshahi though the north-eastern adjacent region of Bengal (Assam) and its some parts were also visited by the cyclonic wind.

Commissioner of the Cooch Behar Division informed that Tura was visited by a cyclone on the night of the 20th September 1872 and "all the buildings [were] down blown or greatly damaged; the road to the plains was said to have been quite blocked up by fallen trees".[61] Government of Bengal once again had embarked on collecting reports and information from the officials posted at the concerned regions.[62] The district of Bogra had witnessed severe destruction of trees, houses and lives. T. F. Bignold, the Officiating Magistrate of Bogra had reported that:

> "…the cyclone of the 20th ultimo was felt with considerable severity in the south-eastern and eastern portions of this District, ….. Early in the morning a strong breeze was blowing from the eastward, the cloud aloft being driven with great velocity, the wind increased in force, until after dark gradually veering to the northward, from which quarter it blow with considerable force until about midnight…… throughout Friday the wind is reported to have blown with increasing force from the south, that towards evening it veered to the east, and later on in the night to the north and west, ceasing at about 3 a.m. on Saturday morning the 21st."[63]

Although the Sudder Station of the district escaped fortunately but the outlying parts were suffered from considerable damage. In Sherpur, 13 miles south of Bogra, buildings were considerably injured and brunches of trees were torn off, and huts were blown down.[64] At Dhunat, an outpost at Sherpur, the cyclone had brought severe destruction: "…..the outpost had been demolished, numbers of native houses in the village had been blown down, trees had been torn up, and of those that were standing many had had their branches torn and twisted in an extraordinary manner. A deserted factory, built of brick, had fallen during the storm, and ……two large native crafts sunk in the river [of Bangali]".[65] Though crops did not have to suffer much from the cyclone but two cases of loss of life within the jurisdiction of this outpost had been conveyed, one man was died by a falling house, and another was drowned with a sinking boat, while a third, as it was apprehending, had probably been drowned since the person was missing. In addition with this, another two deaths were reported within the jurisdiction of Shariakandi outpost where both persons were killed by falling houses.[66] The principal difficulty that emerged in the post-calamity days was the scarcity of bamboos, thatching grass and labour. The sudden increase of demand had not only contributed to the rising prices of these articles but these had become scarce and continued to remain so especially when 'with this difficulty of course no official aid could deal.'[67]

At Sirajganj of the district of Pabna, the loss of life was much greater and it was estimated that the number of persons drowned could be amounted to 'hundreds.'[68] Though there were only '17 or 18 cases reported to the police' but 'dead bodies continued to float down the river until the 24th, if not later.'[69] The paddy which was sown in the *bheels* or deep water had suffered extremely. The Assistant Superintendent of Sirajganj reported that 80 per cent of the *cutcha* houses were blown down, and that 191 large, 500 or 1,000-maund jute boats were submerged under the water and it was estimated that the loss with regard to jute was above a lakh of rupees.[70] However, the account of P. Nolan, the Assistant Magistrate of the district, had forwarded the damage and loss of commodities with more details which showed an increase number of submerged boats carrying jute and other commodities, and the estimate of loss was higher than that of the former estimate.

Table. 2.2:

Damages done to the Sirajganj in the Cyclone of the 20th September 1872.

Nature of Cargo	Number of boats sunk	Maundage of freight sunk	Maundage of freight recoverd	Value of freight lost in rupees	Amount of damage sustained by freight received in rupees	Total loss
Jute	83	Rs. As. P 32,309 0 0	Rs. As. P. 13, 129	Rs. As. P. 57,540 0 0	Rs. As. P. 3,950 0 0	Rs. As. P. 61,498 0 0
Salt	3	561 0 0	……	1,553 0 0	…….	1,553 0 0
Cotton	2	205 0 0	200 0 0	100 0 0	3000 0 0	3100 0 0
Tobacco	1	225 0 0	……	1000 0 0	……	1000 0 0
Straw	1	……..	Received in full.	……..	……..	……..
Mustard	1	250 0 0	……..	800 0 0	……..	800 0 0
Looking glasses, combs, tapes, leads, sundries, and an iron chest,	1	……..	……	200 0 0	……	200 0 0

&c.,						
Rice	1	257 0 0	…….	474 12 0	……..	474 12 0
Pulse	1	125 0 0	……..	150 0 0	…….	150 0 0
Paddy	1	200 0 0	100 0 0	100 0 0	50 0 0	150 0 0
Unloaded boats	15	……	…….	…….	……	……..
Stone	1	……..	Received in full.	……	……	…….
Total	111	34,132 0 0	13,429 0 0	61,917 12 0	7,008 0 0	68,925 12 0

Source: *Table showing the damages done to the at Sirajganj in the Cyclone of the 20th September 1872*. Proceedings of the Hon'ble the Lieutenant-Governor of Bengal during October 1872 (General Department: Industry and Science Branch), Progs. No. 45, WBSA.

P. Nolan, the Assistant Magistrate, had furnished the above account as an estimate of loss of properties caused by the cyclone in Sirajganj where 111 boats, carrying 34, 132 maunds of goods, were sunk and the total damages were amounted to Rs. 68, 925.

However, a great deal of information was based on the assumption and hypothesis which had influenced and reflected in the preparation of the final report by the Collector of the district of Pabna regarding the effects of the cyclone in the district of Pabna. W.V.G. Taylor, the Collector of Pabna had reported on 21st September that:

> "...the station was yesterday (20th) visited with a severe cyclone, which ha[d[caused considerable damage, ……heard but of one death. It had been blowing the greater part of the previous night and early yesterday morning, but from 11 a.m. the wind began to increase, and, veering round from east to north-east 2 p.m., it burst upon us with all its fury and continued till about 4-40 p.m., at which time it was due north. Some 6½ inches of rain fell during the storm,… The jail was much damaged, so much so that, fearing some of the huts might fall in, especially if the storm lasted through the night,…. This morning (21st) …huts have been blown down in all directions, all plantain trees leveled to the ground, that some large trees had been uprooted, and huge branches of many others were lying, blocking up the roads. On the Issamuttee River some two large laden boats and a few small ones were sunk….on the river Pudda there must have been many lives lost. The crops, too, must...have suffered everywhere."[71]

Reports from Pabna which had demonstrated not only different accounts of the cyclone which were distinctive from the other districts but also included some additional information, proved to be very useful, though remarkably contradicted from each other, for the reconstruction of the history of the cyclone of September 1872. The varied information and data collected from different parts of the district showed that how the region was fell under the cyclone with varying degree of severity and damage. In the town of Pabna about 20,000 fruit trees were blown down and 5,000 houses and huts were razed to the ground and crops were also suffered severely in several parts of the district.[72] Since 'the report from the different police stations were more or less meager' so it had not become possible to gather information for all the police stations of the district by the officials even till the early October. W. D. Pratt, the District Superintendent of Police of Pabna had mentioned in his report that

> "… During the cyclone the Challun Bheel altered its appearance entirely. No green was to be seen, but an angry sea, with its waves tearing along, rooting up the rice, and breaking up everything on shore that was exposed to its fury. ….one-eighth of the Challun Bheel rice crop has been damaged……Within the limits of the municipality ten boats were broken up, about 2,000 mango, jack, and other fruit trees were blown down, and 5000 cutcha houses were leveled to the ground."[73]

Given the reports of the Collector and the District Superintendent of Police regarding the account of the duration and direction of the cyclonic wind which was blowing '…..from east to north-east [at] 2 p.m.,' and 'it burst upon….with all its fury and continued till about 4-40 p.m'. But it appeared that from 4 to 5 the wind lulled and after 5 it commenced again with the greatest violence from the north-west. Thus it can be observed that the sudden and changing twist of the wind within a short span of time swayed in different parts of the district in a different manner. But there remained some possibilities of exaggeration of the condition which were evident from the different accounts. The district Gazetteer of Pabna had informed 'about 20,000 fruit trees were blown down', whereas the District Superintendent of Police's account noted that 'about 2,000 mango, jack, and other fruit trees were blown down'; though the number of the damaged houses in both the accounts remained same (5000). In such a situation it appears to be difficult to draw any specific or accurate estimate of the damage done in the Pabna town (municipality area) regarding the destruction of trees. The cyclone was slightly felt towards Aurankhalla outpost, 14

miles from Pubna town, on the high road to Rajshahi. Sugarcane and all high crops have suffered severely and the sub-inspector estimated that the rice had to suffer to the extent of 1/16th of the crop on the ground. Moreover, two deaths and the loss of eighteen more boats including that of with 1,315 maunds coal were said to have been reported.[74] The District Superintendent of Police had been provided with the number of deaths occurred in Dulai (3), Sirajganj (11 more deaths in addition with the previous number), Raiganj (1), and Shazadpur (4) and in addition to this thirty-seven more deaths were reported up to the date i. e. 6th October.[75]

Cyclone of October 1874

The cyclone of October 1874 originated in the Bay of Bengal had passed over the Sand-heads, the Midnapur, Burdwan, and Murshidabad districts en-routed via the districts of Bogra and Rangpur. The cyclone of October 1874 had been regarded as the '*Midnapur and Burdwan Cyclone*' by W. G. Wilson, the Officiating Meteorological Reporter of the Government of Bengal. So far the course and direction of the cyclone was concerned, it was stated by Wilson that:

> "The centre of the cyclone, moving in a north-north-westerly direction, passed over the Sandheads about noon of the 15th. It was nearest to Saugor Island about 5 p.m. and struck the coast-line about Long. 87º 37′ E. Near Midnapore the course of the cyclone re-curved. The centre passed about 15 miles to the east of that place between midnight and 1 a. m. of the 16th, and the vortex passed over the town of Burdwan between 6 and 7 in the morning. Between 1-15 and 3 of the afternoon of the same day the central calm was passing over the town of Berhampore, the storm having then greatly diminished in violence. The centre after this followed a more easterly path, passing to the westward of Bogra, about 10 p.m., and over the junction of the Teesta and Brahmaputra, about 2 a.m. of the 17th. The storm finally broke up on the western ridge of the Garo Hills, approaching, but not reaching, Goalpara in Assam."[76]

The movement of the cyclone was noted by the ships namely *Ireshope*, *Patrie*, *Udston*, and S. S. *Scotia* which were travelling and stationed in different parts of northern Bay of Bengal and observed the different courses of the cyclone in different times. Many about the wind pressure,

cloud structure and rainfall in the Bay of Bengal during the cyclonic days had been obtained from the logs of the ships. But at the same time it was difficult to assume any uniformity between the logs of the different ships so as to the information, and thereby to draw any conclusive remarks. However, the cyclone was accompanied with varied amount of rainfall in different parts of Bengal.

Table. 2.3:

Rainfall in Bengal between 15th and 17th October, 1874 during the Cyclone

Districts	**Areas**	**15th**	**16th**	**17th**
Burdwan	Burdwan	0.36	7.43	…..
	Cutwa	0.30	4.30	…..
	Bood-Bood	0.26	8.40	…..
Midnapore	Midnapore	…..	10.27	…..
	Tumlook	0.87	4.50	…..
	Contai	3.58	5.47	…..
24 Parganas	Saugor Island	3.90	1.44	…..
	Calcutta	1.27	4.56	…..
Moorshedabad	Berhampore	0.49	5.93	0.03
	Rampur Hant	…..	5.92	…..
	City Moorshedabad	3.02	2.80	…..
	Jungipore	1.33	8.00	…..
	Azimgunge	0.29	4.93	…..
Dinagepore	Dinagepore	…..	0.28	2.80
Malda	Malda	0.12	2.29	0.05
Rajshahye	Beauleah	0.32	3.80	…..
	Nattore	1.10	3.13	…..
Rungpore	Rungpore	…...	1.89	6.97
	Bhowanigunge	0.51	2.85	2.15
Bogra	Bogra	1.34	3.10	…..
Pubna	Pubna	0.12	1.43	…..
Cooch Behar	Cooch Behar	…..	0.56	3.96

Source: Extracted from W. G. Wilson, *Report on the Midnapore and Burdwan Cyclone of the 15th and 16th of October 1874*, pp. 8-9.

It is evident from the above table that rainfall in different parts of Bengal was not only varied but it had appeared in diverse amount of variety between 15th and 17th. In the 17th i. e. the immediate day of the disappearance of the cyclone, there was virtual absence, rather very meager

except in Dinajpur, Rangpur town and Cooch Bihar, of rainfall in all parts of Bengal. Rainfall, especially in different areas of the districts of Burdwan, Midnapur, and Murshidabad was increased in 16th than the 15th. On the other hand, in the north of the Ganges i. e. in the northern districts, especially in Rangpur and the Princely State of Cooch Behar, the rainfall was not so much heavy with a nominal fall in Darjeeling and Jalpaiguri districts. Even in the preceding days of the cyclone rainfall in Bengal as a whole was remarkably scarce.[77]

Two of the Government meteorological observatories viz. Burdwan and Berhampur had fallen on the centre of the passage of the cyclone and the latter had provided more valuable barometric information than the former due to the inability to the access of barometer instruments in the late at night when the cyclone commenced in Burdwan.[78] Midnapur and Burdwan had to bear an extensive loss in terms of life and property during the cyclone as the storm had made its visitations more severely in these two districts than the other.[79] Among the northern districts of Bengal 'there was no cyclone' in the districts of Pabna and Dinajpur where 'only a fresh breeze' and 'a moderate gale only was experienced' respectively.[80] But the districts of Rangpur, Bogra, Malda, Rajshahi and Murshidabad were seriously hit by the cyclone. In Rangpur though there was 'no apparatus to be availed of to note' the degree of velocity and barometric pressure 'down at the time' but despite of that it was reported that 'the wind commenced blowing from the north-east at about 7. 30 p.m. on the 16th Oct. 1874' and 'it gradually increased in velocity and fury, and veering round through the E. and S., at last died out at the S. W. at about 4 p.m.'[81] After the midnight of the 16th the wind became strongest and in the early morning of the 17th it returned further to the north-west and west.[82] As a result many houses and their bamboo attachments had been raged down and around five boats laden with jutes which were proceeding at the mouth of the Tista near Kalmi had been overturned and submerged.[83] However, 'no loss of life or any such serious accidents' were reported. But 'the tobacco crop and cold weather vegetables [had] been irreparably damaged' since it seemed to be noted that 'this ton was on the extreme left border of the passage of the cyclone.'[84]

At Bogra the gale initiated at around 7 p.m. of the 16th and reached at its height at 10 p.m. when the wind was swinging from east by north to south-east.[85] On the 15th, the day previous to the

gale, there was uninterrupted heavy rain with variable winds and the total fall of rain up to 6 p.m. of the 15th was 1.34 inches.[86] The centre of the storm was passed from the western part of Bogra which was very near to the junction of the river Tista and Brahmaputra where the storm was appeared with its maximum velocity and power in comparison with the neighbouring areas.[87] Though there was no loss of life in the district of Bogra had been reported but considerable damage was done to the thatched houses and heavy branches of the larger trees were twisted off.[88] In Malda the weather began to change from the night of the 14th when 'clouds collected all around' and on the 15th the rain was started with a serious gale blowing from north-west to east and on 16th it was increased to a considerable amount with an eastward direction.[89] But the Officiating Collector of Malda was of the opinion that there 'was no cyclone in this district, though the 15th and 16th were very stormy' and 'a good number of trees were blown down in *thana* Gomastapur towards the south of the district, as well as a few huts, and six salt boats were sunk in the Mahananda'.[90] In fact it was opined by him that there was no 'great damage' caused by the cyclone and the rain was proved to be beneficial for the rice crops.[91]

In the town of Rampur Boalia of the District of Rajshahi the cyclone started from 3 a. m. of the 16th October. In the morning, the storm had increased and blowing from a north-eastern direction and as the day was proceeding the wind got stronger and veered to the east and then curved to the south-east accompanying with a heavy rain.[92] The meteorological register at the station of Rampur Boalia had recorded the following barometer and thermometer readings along with rainfall during the 16th of October:

Meteorological Register kept at civil station of Rajshahi on the 16th of October 1874.

MONTH AND DATE – OCTOBER 16TH

At 10 A.M.

Barometer ….. ……. …… …….	29.70
Thermometer	
Of morning …….. …… …….	0
Of air ……. …… …….	80
Of wet bulb ……. …… ……	0
Direction of wind ……. …… ……	E

At 4 P.M.

Barometer …… …… ….. …….	29.25
Thermometer	
Of morning …….. …… …….	0
Of air ……. …… ……	80
Of wetbulb ……. …… ……	0
Direction of wind ……. …… ……	W
Thermometer in sun's rays …….. …… …….	80

CLOUDS

At 10 A.M. …….. …… …….	10
At 4 P.M. …….. …… …….	10
Rain-fall …….. …… …….	3.80

Level of sub-soil of water distance from the surface of the ground …….. 3.6

REMARKS.- Much rain whole night and day, stormy after noon.

Beauleah, (Sd). R.A.K. Holmes
October 29th 1874. Civil Surgeon, Rajshahye.

Source: [Collection No. 4. 31/32] From W. H. Doyly, EsQ., Collector of Rajshahye, to the Assistant Secretary to the Government of Bengal, Statistical Department. – (No. 2904, dated Beauleah, the 29th October 1874), WBSA.

The above meteorological record has shown that in the morning (10 a.m.), the wind was blowing from eastern direction but in the evening (4 p.m.) it was veering from the south and the quantity of rainfall was increasingly high throughout the day. The cyclone in the district caused

considerable damage to the properties and lives. A number of fine trees were uprooted in the station, and many *cutcha* houses in the town were blown down or damaged.[93] Although rice crop had suffered slight damage but the loss of rahur and sugarcane was considerable enough. It was reported that about 100 boats were sunk at the ghats, but many were subsequently raised and a silk factory to the east of Surda was blown down.[94] From the police reports, it would appear that the violence of the storm was greater in the western *thanas* of the district than elsewhere, viz., Godagari, Tanor, and Manda, where it continued blowing till midnight.[95] The report had ascertained that there were total lives lost by the cyclone: one man was drowned in Singra by the sinking of his boat, one man was killed by a falling branch, and two men were killed by falling walls.[96]

In Murshidabad, however, storms appeared in different parts of the district in different times and continued to blow there for some time.

Table. 2.4:
Wind direction in Murshidabad during the cyclone of Oct. 1874

Area	Direction (blowing from)	Time of Commencing
Ramnuggur	North	Evening of the 15th
Gonateea	East	Ditto
Gouripore	Northerly North Western	5 p.m. of the 15th
Putkabari	North East then East by North	Though started on 15th but got stronger in the 16th
Beldanga	East	Began in morning of the 16th
Kandi	East	Night of the 15th
Rungamuttee	South-East	Morning of the 15th
Berhampore	East	Morning of the 16th
Moorshedabad City	Easterly South East	Morning of the 16th
Azimgunge	East	1 a.m. of the 16th

Source: Extracted from W. G. Wilson, *Report on the Midnapore and Burdwan Cyclone of the 15th and 16th of October 1874,* pp. 69-70.

The above table has shown that the storm appeared in the district on the 15th of October and stretched to the length and breadth of district from the late-night of the date. The centre of the storm had passed over at Kandi, Beldanga, Berhampur, Murshidabad, Azimganj, and Akriganj and crossed the Ganges passing through the district of Rajshahi.[97]

The cyclone in the district of Murshidabad had resulted in large scale destruction of lives and property. The loss of human life and cattle that was reported was amounted to 27 and 95 respectively, though remained under-marked and subject to the verification of the further reports obtained from the police from different parts of the district.[98] Apart from these, crops this time had to undergo a considerable damage: mulberry, sugarcane, til, and chilli crops, and to the advance portion of the winter rice-crop had suffered severely of which the til crop was the worst sufferer.[99] On the other hand, it was ascertained that the "Kartiki" or early transplanted *dhan*, which was used to be cut in Kartick, had 'not been damaged, and the crops in the Bhudrehat thana [would] certainly yield a splendid outturn'.[100] Nonetheless, it was said to believe that though the advance portions of the winter rice-crop was suffered maximum from the cyclone but the latter transplantations of the crop was immensely benefitted from the rain and proved to be profitable in the year of scarcity and shortage. But it is to be noted that the considerable amount of loss in the rice-crop during the early years was not entirely compensated by the latter harvest even though the damage caused to the early transplantations was 'as nothing compared to the benefit caused to the late transplantations' which 'formed the bulk of the crop.' Death of three persons crushed by falling houses was reported from Berhampore and it was informed that some boats had been exhausted near Azimganj.[101]

The multi-dimensional travelling of the wind with varied quantity of rainfall in several parts of the district had, as it was believed, prevented to formulate any concept of uniform direction and force by the observer of the cyclone. Despite of that the passage and duration of the storm was noted down from the information obtained from the Government Meteorological Observatory situated at Berhampur and from Babulbona by Mr. Stocks. From the Berhampur Observatory it was reported that 'about 7 o'clock in the morning of the 16th the wind, which had backed round to the N. E., was beginning to blow strong in the ghusts' and the velocity was increased from 7 to 8 a.m. 'to 21.6 miles an hour' when the barometer 'was commencing to fall rapidly.[102] The barometric information which were recorded by Mr. Stocks had shown the following readings:

Table. 2.5
Barometric readings taken at Baboolbonah, 16th October 1874.

Hour	Barometer	Wind	Rain
A.M.			
7	29.680	Blowing strong in gusts, E. … … …. …..	Very heavy
7-30	29.660	Gale increasing from N.E. ….. …… …..	Very dark and heavy rain
8	29.630	Strong gusts from N.E. and E. …… …..	Not so heavy, and clear above
8-30	29.630	Terrific gusts from N.E. and E. …… …..	Heavy rain, dark clouds, S.
9	29.620	Ditto increasing ditto …. ….. …. ……	Very heavy Heavier than ever;
9-30	29.570	Terrible gusts, blowing N.E. ….. ……	compound one sheet of water.
10	29.570	Ditto ditto ….. ….. ….. …… ……	Less rain
10-30	29.540	Storm as bad as ever, blowing from all sides, principally E. …. …. …… ..	Heavy rain falling.
11	29.500	Ditto ditto … …. ….. ….. …. ….	Ditto
11-30	29.430	Most terrific gusts N.E.	Ditto
P.M.			
12	29.340	Hurricane, blowing ditto	No rain
12-15	29.270	Ditto S.E. …. ….. … …… ……. …… ….	Ditto
12-30	29.210	….. … ….	Ditto
12-45	29.140	Ditto E. and S.E. …….. ……. ….. … ..	Ditto
1	29.100	……. …..	Cleared up
1-15	29.090	Stronger than ever, ditto …… …… ….. … … …	
1-30	29.080	Terrible to look at, ditto …… …… ….. ….. …. ….	Sunshine
1-45	29.100	Wind calm, S. ….. …… ……	Heavy clouds N.
2-15	29.110	A fine calm day ditto …… …… …….	
2-30	29.130	Ditto ……. ……. ……. ….	
3-15	29.240	Clouds gathering, wind W. …….. ……..	
4	29.440	Ditto ditto …… ……..	Rain falling
4-30	29.520	Blowing strong from N.W. …… ….. …..	Heavy rain
5-30	29.620	Ditto ditto …….. ……. …… …….	Slight rain
6-15	29.670	Ditto ditto …… Little wind from N.W.	Clouds drifting S.E.

Source: [Collection No. 4. – 40/41] *From W. Wavell, EsQ., Officiating Collector of Moorshedabad, to the Assistant Secretary to the Government of Bengal. – (No. 324Ct., dated Camp Khurgaon, the 21st November 1874.)* Proceedings of the Hon'ble the Lieutenant-Governor of Bengal during January 1875 (General Department), WBSA.

The above barometric readings had shown that the wind generally commenced from the eastern direction accompanying with heavy rain moved to the north-eastern direction till the 12 noon when rain was stopped. However, rainfall was uniform throughout the day, sometimes it increased to severe but ultimately it was 'cleared up' at 1.15 p.m. and sunshine appeared at 1.30 p.m. But the sudden change of weather brought about clouds and it was again started to fall heavily at 4.30 p.m. though finally clouds were drifting towards south-east. It was opined that the escape of the northern part of the district was probably due to the easterly inclination of the storm.[103]

It was between 31st October and 1st November of 1876 when another cyclone hit the lower portions of the Bengal. Originated in the Bay of Bengal the cyclone had travelled a long way and struck Vizagapatnam in South India and brushed up in the districts of Buckharganj, Noakhali and Chittagong of the lower provinces of Bengal.[104] As a result of the cyclone 'the mouth of the Meghna, known as the groups of Sundeep,….the islands of Hattea, and Dukhin Shahbazpur ……., and the western coast of the great river within the district of Backergunge' were severely suffered. In addition to this, the districts of Buckherganj, Noakhali and Chittagong had to undergo through a severe attack by the cholera epidemic during the days of the cyclone. [105] However, the cyclone did not move towards the north of the Ganges and therefore, the northern districts of Bengal had fortunately escaped the visitation of the cyclone.

Cyclones of Local Origin in North Bengal

Apart from the long-distance cyclone which had originated in the Bay of Bengal and travelled through a long way to enter into the land, there were occurrences of local hailstorms which had brought about considerable damage to the life and property of the region. The princely state of Cooch Behar had been visited by a violent hail storm which had passed over a part of the state in March 1887.[106] Due to the appearance of the hurricane that "raged in the town of Cooch Behar at about 9 P. m. on the 29th March….many huts were, levelled down and trees uprooted; even

some strongly built houses with corrugated iron roof or grass thatching were seriously damaged."[107] The storm coming from the north-west and accompanied with rain and hail-stones though had continued for only 10 minutes but it took away four lives within a short span of time.[108] In April 1st 1907 at 11.30 a.m. a severe hailstorm had occurred in the district of Malda. The storm hit the district from the 'Sonthal hills on a front of two miles southward of Manikchak and extended to Bholahat, lasting for half-an-hour.'[109] Crops like wheat and mulberry and mango trees had to suffer serious loss. It was reported that 19 persons were killed by this violent storm and 'numbers were wounded by the hailstones,… [while] birds, monkeys and dogs were killed in large numbers.'[110] However, situation became worse when one natural calamity had been followed by another natural calamity, like – landslide or land-fissures followed by earthquakes or flood followed by heavy rainfall and cyclonic storms. Such an example can be seen in Darjeeling in 1899 when four consecutive and uninterrupted natural disorders – cyclone, heavy rainfall, flood and landslides had taken place. The details of these occurrences have been discussed in the chapter on flood and here we can have a brief account about the invasion of the cyclone which had created the ground for the other disasters.

The 'Darjeeling Cyclone' in 1899

The year 1899 will long be remembered at Darjeeling as the year of the great disaster. After the violent earthquake of 1897, minor landslides were a frequent occurrence. Darjeeling's rainy season of 1899 was exceptionally heavy, with an unprecedented downpour on September 23rd, 24th and 25th. The beginning of the disaster was brought forth by a cyclone on 23rd which after entering the district moved to the north-west direction and was extended to the north-east 'as far as the Ramman and the Rangit rivers and to the north-west as far as the boundaries of the district' and it was more violent 'from a point 6 miles south of the station of Darjeeling.'[111] The thunder-storm of Saturday (23rd) was started at 1.30 p. m. and this was succeeded by excessive rainfall which continued till 8 p. m. of the night. The storm was lasted for whole of that night and

all the next day and night (Sunday, 24th) and continued till about 3.30 a. m. (Monday, 25th). 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. 2.6:

Rainfall (in inches) at Different Places of Darjeeling in 23rd – 25th September, 1899

Place	Rainfall
Kalimpong	13.96
Pedong	7.58
Kurseong	19.85
Mangpu	16.85
Tiger Hill Tea Estate	29.42
Happy Valley Tea Estate	27.20

Source: O'Malley, L. S. S., *Bengal District Gazetteers: Darjeeling*, Calcutta, 1907, p. 129.

The sudden and excessive rainfall in certain places was succeeded by heavy landslips, for example, the landslip at Rangbi 'extending from an altitude of 7, 000 feet to the bottom of the valley' produced loosening of land almost upto 250 yards.[112] The total rainfall for the year 1899-1900 was 144.4 inches.[113] The cyclone accompanying with excessive rainfall took a heavy toll in the district of Darjeeling. E. C. Dozey had recorded the aftermath of the calamities in the following manner:

> "In the town of Darjeeling 10 Europeans and 62 Indians perished (of these 45 died on the precipitious eastern side of the hill) ; in Kurseong there were 9 deaths; while in the district no less than 219 souls perished either from exposure that followed the storm, or by being engulfed in falling debris or slips…"[114]

The number of deaths and estimate of overall destructions had, however, varied in different accounts. *The Fairfield News and Herald* had reported the following impact of the cyclone I the district:

> "It is estimated that between Darjeeling and Kurseong alone 300 persons have lost their lives. … The storm appears to have been extended all over the northern portion of Bengal. Considerable damage has also been done at Silliguri, where a number of wooden huts and the plague camp have been destroyed. The subsidence of the hillside at Darjeeling continues, and is causing alarm, as it threatens to destroy the whole Bazaar. Although the delayed reports from many sections prevent accurate estimates, it is evident that the fatalities far exceed 300. No fewer than 209 persons were killed in the destruction of Phool Bazaar alone; and as many as 100 at Darjeeling. Twenty-one bodies have been at Tamsongbate, where it is believed another 20 persons have been killed. Advices from Rungli show great destruction in the tea gardens around Poomong, Monday night."[115]

Apart from the above account of the destruction caused by the cyclone, huge amount of loss of lives had been reported as a result of severe flood and devastating landslides which did not even mercy the Europeans. Perhaps this was one of the natural disasters from which the Europeans could not escape despite of their 'efficient' control of the nature. Their conception of sanatorium had for a while been trembled down by this disaster (discussed on the chapter on flood). Although the cyclone had engulfed the whole of the district but there was no sign of the impact of the cyclone outside the district.

The cyclones originated in the Bay of Bengal and after running a long way to the land of northern districts of Bengal had brought about, at many times, havoc to the society and economy of northern Bengal. However, the cyclones occurred between 1864 and 1874, and in 1899 had diverse impact to this part of Bengal. There is no doubt that the lower provinces of Bengal which fell nearer to the centre of the cyclones had to suffer the maximum damage and destruction in terms of life and property. Despite of being distant to the place of origin of the cyclones northern districts of Bengal had to witness considerable destruction, though varied in amount and severity. The local storms sometime became more dangerous for the region, where it originated, as was in the case of 1899 Darjeeling cyclone. The above portion of the chapter on the various aspects of the cyclones has already demonstrated the condition of life, property, society and economy of northern Bengal during the time of cyclone. But one may assess the post-disaster complexities

prevailed in the realm of social relations and economic production through a comparative and critical study.

It was observed that sometime the centre of the cyclone had passed over some parts of northern Bengal. The centre of the 1864 cyclone was passed over from Nattore of the district of Rajshahi. The cyclonic impact in the northern districts of Bengal had varied due to the variation in velocity and direction of wind. The situation was aggravated when the storms were carrying huge amount of rain which induced the possibility of flood. Cyclones accompanied by flood produced maximum destruction of life and property. Commodities had been drowned in water which amounted to considerable loss of for the producers and traders.[116] The sudden loss of regular commodities adversely affected the prevailing trading system. Government, though sometime, had intervened into this situation but it was not sufficient to deal with. The amount lost in the cyclones to be estimated by the government was frequently contradicted with the private estimation. Boats carrying the commodities were drowned in the water. Sinking of boats had been reported by the police or sub-divisional officers at several times. Crops were severely suffered from the cyclones. Storms and flood had a dual adverse impact on the agriculture of northern Bengal where large scale destruction of crops resulted in the price-rise which added to the sufferings of the people. As one can notice that storms had occurred during the season of autumn when abundant rice were produced, it was struck severely for the peasants and traders who heavily depended on autumn-rice, the chief harvest of the year. There was, however, no zamindari or State relief in this regard though for 1876 cyclone there was a rudimentary system of state relief.

Trees and houses were destroyed. *Pucca* houses faced more damage than the *cutcha* houses. The cyclones occurred between 1864 and 1899 had caused loss of life - both human and cattle in the districts of northern Bengal. Deaths which were caused by the falling of trees and drowning in the water were reported by the police. There were several incidents of women dead bodies had found. The police reports on the account of number of death took place in the several cyclones had not only varied but also contradicted. Sometime it was even more difficult to decipher the main cause of death – whether falling of trees, or roof, or thunder, or suffering from long term

illness. When police reached to the area devastated by the cyclonic winds or floods it was much difficult to trace out for them the actual number of deaths occurred because flood had drowned the bodies or carried over the other places. It was rarely heard about any governmental relief to be extended for the families of the dead person. In many cases government had not only overlooked the prevalence of diseases in northern Bengal during the time of cyclone but denied any need of assistance whereas it showed much concern for the cholera epidemic broke out in 1876 cyclone in southern Bengal because the epidemic had ravaged a sizeable area and population of that region. But rescue operation was not a common feature then especially for the cyclone victims. Cyclone induced mortality had hardly generated any tension in the official circles as 'living or dead no rescue could be attempted'. Whatever little measures in the later years had been conducted by the government was just 'to let the poor people see that the authorities are thinking, caring, feeling for them' in their suffering.[117]

Meteorology and Colonialism: Evolution of Theories and the 'Laws of Storm' in Nineteenth Century

The second half of the nineteenth century witnessed a considerable generation of knowledge in the realm of cyclonic appearances, their causes and impact. Meteorological study has attained significant importance in the colonial administration. In fact, it was during the sixteenth century when the Western European powers were set out to establish their commercial hegemony over the world and for that reason they were inclined to collect information about 'atmospheric circulation'. While Chinese, Arab, Malay and Polynesian peoples among others also attained degrees of mastery over this subject, none perhaps did so in such a capacity for the same goal in mind as the mariners of Western Europe had accomplished.[118] The second half of the nineteenth century witnessed a steady and systemic growth of meteorological knowledge in Home through the establishment of British Meteorological Society (1850) by James Glaisher which in 1833

came to be known as Royal Meteorological Society.[119] The navigational necessity of the traders acted as a great motivation for development of science in Great Britain. Astronomy was the first modern science to be brought to India, as a geographical and navigational service though its early use was irregular and generally out of personal interest.[120] There is no doubt that meteorology appeared to be indispensible for a trading nation for establishing the commercial hegemony in the sea routs and this necessity prompted them to discover 'law of storms' so that they could tame seas. It can be noticed from the several reports of the Bay of Bengal cyclones during the second half of the nineteenth century which were prepared for future administrative records that the ships sailing at the Bay of Bengal had provided data regarding the occurrence of the storm in the sea and its passing route to the land. However, there remained a considerable amount of confusion in the log books of ships since the ships were stationed in different locations at the sea and observed the passing of the storms in different times – thus it was very difficult to form any unanimous argument for the origin of the storms. The meteorological observatories or stations which were built in Bengal for collecting vivid account of the cyclones even provided confusing statistics which had placed the origin of the storm 'somewhere' in the Bay of Bengal. It has been mentioned in the Report of the Cyclone of 1874 that there prevailed a great deal of 'uncertainty' in the 'weather indication' observed from the observatories of Calcutta and Saugor Island due to their preceding locations to notice any significant fall of the barometer or increase in the force of wind and this uncertainty led to the confusion in terms of determining the 'probable position and subsequent course' of the storm.[121] This was not only the case for 1874, instances can be drawn from the previous cyclones 'to illustrate the uncertainty which attends the prediction of storms at the close of the south-west monsoon.'[122] However, variability in general indication of weather and changes in barometric readings had distinguished the change of course of the storms from south-west to north-east and vice versa. The characteristics of the storms had varied in terms of their duration, vortex, their rate of motion and the extent of atmospheric turbulence that preceded and accompanied them. Generalization on the magnitude and barometric indications has been made in the official Report of the cyclone of 1874 which was said to be implemented to all the preceding cyclones that had arrived at the shores of Bengal from the middle or southern parts of the Bay.

> "…the area of low atmospheric pressure to the northward of a cyclone, when it has advanced up the Bay to some distance from the latitude of its origin, appears to be of no very considerable extent relatively to the magnitude of the storm itself. Thus it is not until a place is near the limit of the gale of wind which surrounds the body of the advancing cyclone that any decided fall of the barometer takes place."[123]

Notwithstanding the generalization, the flexibilities or steepness of the barometric fall and the extent of atmospheric depression contributed to the remarkable deviation of the vortex and course of the cyclones. In fact the pilot vessels or ships which were stationed at seas to notice the advancement of the cyclones were sometime caught within the vortex of the storm but this difficulties were solved by the 'long experience [of the commanders] with all the indications of their [storms'] approach' which helped to 'manage to keep their vessels at least at a safe distance from the centre of any storm.'

British ships and their log books represented itself as the main instrument and source of information for the meteorological knowledge which were indispensible not only for the commercial purpose but for the safety of the ships themselves. The emergence of colonial meteorological knowledge as a distinctive discipline *per se* science was not a sudden event because even in 1800 meteorology 'was neither an academic discipline nor an administrative office…'[124] Despite of that endeavours had been directed by the meteorologists towards cataloguing the variabilities, elements and changes taking place in the cyclones throughout the nineteenth century. Even the early part of the nineteenth century had witnessed the initiation, though very small in scale and extent, of the process of collection and analysis of meteorological data and information. Thus the generation of 'cyclone theories' was an early-nineteenth century phenomenon. Colonel Capper in 1801 had observed that the storms of the Indian Ocean were 'whirlwinds or rotatory storms' and he further went on to say that 'it would perhaps not be a matter of great difficulty to ascertain the position of a ship in a whirlwind by observing the strength and changes of the wind.'[125] However, the earliest writer of importance on the subject of cyclones was Mr. Redfield who had written a series of papers to American scientific journals from 1822 onwards which contributed to the development of the earlier findings and asserted that the storms originated in the Indian Ocean were vast progressive whirlwinds or rotating storms moving along curved paths. The circular theory was also attested by Lieutenant-Colonel

Reid, of the Royal Engineers, in his writings on the law of storms. He had emphatically laid down the generalization that in the rotary storms of the tropical regions of the northern hemisphere, the direction of rotation of winds was north-west-south-east i.e. anti-clockwise, and on the other hand, for the case of storms in the southern hemisphere the direction of rotation was north-east-south-west i. e. clockwise.[126] Reid's study, published in 1838, was, however, based on 'curious facts' which he collected from the 'accounts of previous storms' that took place in several parts of the globe – in Caribbean region (Barbadoes, Antigua, Apolachicola, St. Marks), in Mauritius (1818, 1819, 1824, 1834, and 1836); and the tornedos occurred in the western coast of Africa. After verifying the existing theories of cyclones 'by making charts on a large scale', he had produced a great deal of knowledge that helped immensely for the guidance of mariners sailing on the tropical ocean where the book could be more necessary for the purpose of 'practical use in navigation'. Providing a stimulus for the mariners he said that: "It would not, perhaps, be a matter of great difficulty to ascertain the situation of a ship in a whirlwind, by observing the strength and changes of wind."[127]

The necessity to record meteorological accounts was once again firmly installed by Henry Piddington, President of the Marine Courts of Enquiry at Calcutta who had the access to the logs of the ships which were damaged by cyclones. Piddington had carefully interpreted and then complied the experiences of the Captains, which were written in the logs, into twenty-five volumes and these were came out in the *Journal of the Asiatic Society of Bengal* (*JASB*) under the title of '*The Law of Storms'*. Later H. W. Drove in his *The Law of Storms* had distinguished different forms of winds called by different names. To quote Drove: "… those whose direction is constant being called *gales*; those which have a rotatory motion *hurricanes*, or as Piddington calls them, *cyclones*; and lastly, rotatory storms of smaller dimensions being termed *trombs*."[128] Piddington's observations had been considered as more scientific and trustworthy by the British mariners and officials who heavily relied on them. According to Piddington storms were generated in an area of low atmospheric pressure in an eastward direction in the Bay of Bengal which moved northwest. These oval shaped storms having anticlockwise wind direction were rotatory in characters and went through a fixed design of rotation and expectable speed in the northern hemisphere. He has shown the possible way of measuring the shape, speed and the

vortex of the cyclones.[129] Thus Piddington had agreed to the theory of rotatory winds in the storms. He significantly contributed to the generation of valuable knowledge regarding the scientific analysis of different aspects of a cyclone. This knowledge, in fact, became the bedrock of the future meteorological researches carried out by the colonial officials and mariners. Piddington has been regarded as the founder of the term 'cyclone for the peculiar swirling storms of his region'.[130] But unfortunately the laws made by Piddington did not have any decisive impact during his lifetime. Furthermore, it was not possible for the sailors to enter into the vortex of the storm nor to remain at a safe distance from the sea and this cumulatively hindered the process of collection of accurate data. The ships located in the different parts of the ocean were supposed to experience storms differently and moreover, there was no system of communication of the ships among each other.

The proponents of the circular theory had somehow overlooked the other aspects of the cyclones. The contemporary colonial official assessment regarding the works of Reid or Piddington had declared as based on 'assumption' and asserted that there is no doubt that defining the wind directions as rotatory was a hypothetical assumption or 'a rough approximation to the actual character of the atmospheric motion during cyclones'.[131] There were numerous other synchronous storm charts prepared by various meteorologists who had emphasized a centripetal or indraught wind direction and in assimilation with the rotatory winds there originated a spiral or incurving motion of the air towards the centre. This 'centripetal theory', later adopted by Mr. Espy, of Philadelphia, had provided the possible explanation of falling of trees during cyclones when winds were blowing or converging towards a particular centre. Since the cyclones originated in the Bay of Bengal visited far inside the country accompanying with heavy rain, Mr. Espy's proposition is of high importance here which laid down the generalization that the falling of rain during cyclones was caused by the creation of an upward motion of strata in and above which compression is situating and which invited in-draught from all directions in the lower atmospheric strata and an out-draught in the higher.[132]Cyclones originated in the Bay of Bengal during the second half of the nineteenth century had been frequently observed carrying a huge amount of water with them. Sir John Herschel (1861) had revised to some extent Espy's centripetal theory and Drove's law of gyration (rotation). After evaluating both the theories he

asserted that cyclones were product of the action of local heat producing an upward extension and vertical motion of the air over a specific region which was followed by an in-drught or centripetal direction of wind from the neibouring areas when rotation induced the deflection of winds in approaching the centre and this ultimately resulted in an inner spiral motion round a centre.[133] Herschel had provided a very useful and important definition of meteorology when he stated that:

> "Meteorology, in short, in all that concerns numerical valuation, is pre-eminently a science of detail, and one in which all the subordinate laws which are susceptible of numerical statement have to be made out by laborious and continued observation carried on in every region of the globe. The results of such observation,….freed from the influence of transient and purely local causes of irregularity, and presented in the form of mean or average conclusion, each expressing some general fact or law of progressive change."[134]

Thus it can be observed that in the second half of the nineteenth century the subject 'meteorology' had been regarded by the meteorologists 'a science' which was no doubt a remarkable breakthrough in the realm of researches on the evolution of cyclone theories and meteorology as well.

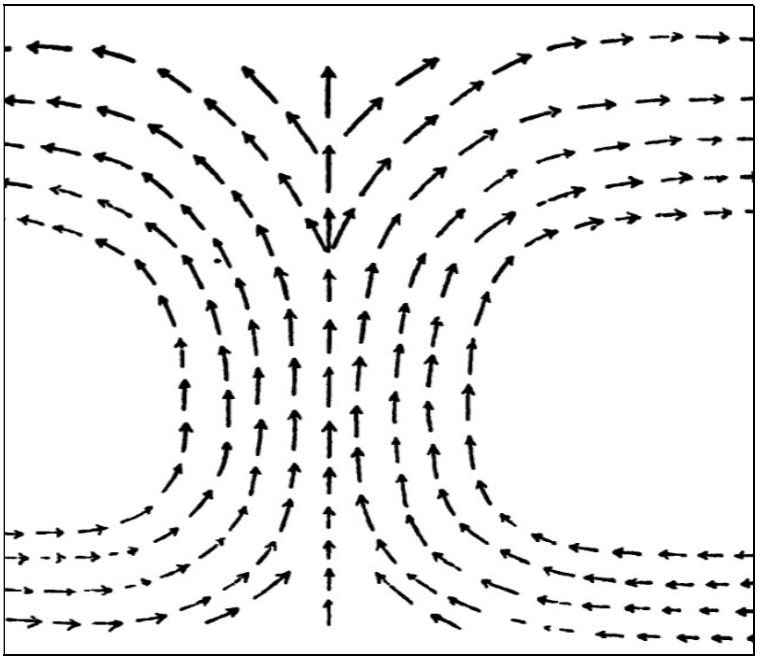

Figure. 2.1
Wind direction from the centre

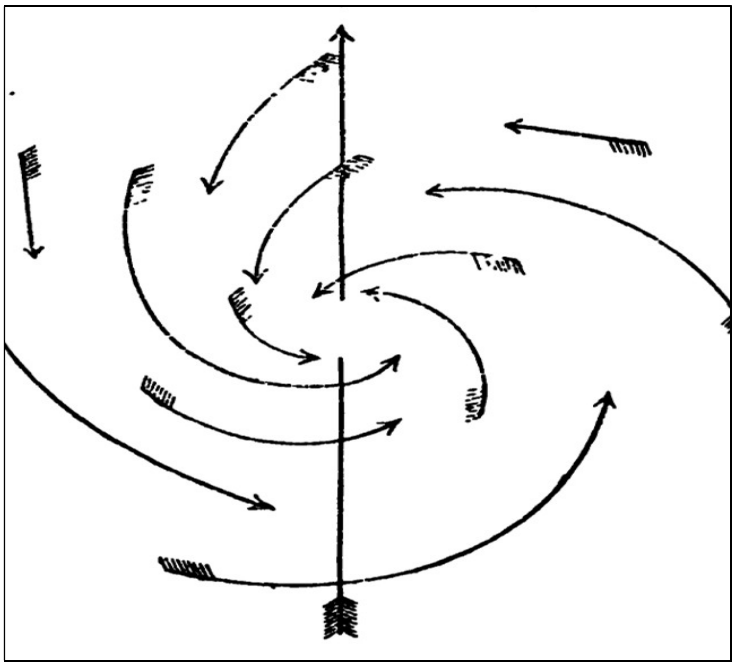

Figure. 2.2
Wind direction towards the centre

Source: John Eliot, *Handbook of Cyclonic Storms in the Bay of Bengal for the use of Sailors*, (1890), pp. 13-14.

John Eliot in his *Handbook of Cyclonic Storms* had depicted the above figures containing the centre (origin) and direction (circulation) of winds which were drawn into the centre but not drawn directly to it. The wind direction was followed by a circular or spiral path heading towards the centre.

The theories regarding cyclones had been modified and enriched further by Henry Blanford and J. E. Gastrell (in *Report* on October 1864 cyclone), and W. G. Willson (in *Report* on October 1874 cyclone). Mr. Blanford was credited as one of the author of the *Report* on October 1864 cyclone which was published in 1866. Blanford had put forward the theory of local depression in analyzing the causes of the 1864 cyclone. Though it is now a day a well-known theory but in those days it had a valuable contribution in the area of cyclonic knowledge. Vapour had been ascertained to be the main factor which was created by the combination of light variable wind over the open sea and high temperature, and when vapour got condensed as a result of reduction of its latent heat and lasted for a long time (say for some days) the atmospheric pressure would be locally depressed, thereby to invite inward wind movement to the place of minimum or

depressed pressure. Later Mr. Willson had developed a theory of opposite-parallel winds which was previously put forward by Mr. Meldrum. Mr. Meldrum had found a relationship between solar spot frequency and cyclone prevalence frequency which were created by the action of laterally parallel opposite currents of winds. In this theory it was stated that the rotatory motion and the barometric depression at and near the centre were created due to the action of the opposite and parallel winds. Adding a local dimension in it, Mr. Willson had supported the theory of opposite-parallel winds for analyzing the origin of the October, 1874 cyclone.

Thus one can notice the process of generation and development of knowledge regarding cyclonic occurrences. The natural phenomenon, cyclone, appeared to be an indispensible subject to be dealt with the methods of meticulous analysis and scientific research for its vitality in deciphering the commercial and more broadly, imperial necessities to rule over the ocean. However, researches and enveavour on the part of the mariners and meteorologists' one the one hand and administrative facilities and governmental initiative for proper registration of these events on the other did not go always hand in hand. In fact, Governmental dilemma in terms of the amount of funds to be allotted and spent for the already existed meteorological observatories in India or for the proposed stations in Bengal had unfolded the layers of indecisions and apathy on the part of the colonial government to introduce any sustainable policy even in the later half of the nineteenth century.[135] At the same time the colonial government was not in a mood to allow any experiment for setting up makeshift or temporary meteorological stations. Sometime, even the recommendations of the 'skillful' meteorologists doomed to be a failure as a 'mere fact' that 'would not justify their recommending the establishment of a second class Meteorological Station…; such a recommendation they can conceive be justified only on grounds of a permanent character,…'However, despite of all these reservations 'with a view to a more complete and uniform distribution' the meteorological committee had recommended the establishment of two stations at the north of the Ganges, viz. Muzzaffarpur and Dinajpur , and one to the south-west Bengal viz. Midnapur.[136]

A large amount of cyclonic data had been recorded with the help of barometric and thermometric information captured during the time of storms. However, it was noticed in the case of the cyclones appeared in the Arabian Sea (Western India) that:

> "…the errors of the barometers varied from about sixth-tenth of an inch below the truth of about two-tenths above it, and that in half the cases the errors exceeded one-tenth of an inch. The barometric observations were not only corrected for index errors, but also reduced to 32º Fahr. and to sea level…all glaringly inconsistent readings were rejected…. Before entering the barometric observations recorded at land stations on the charts, a correction of diurnal variation, to reduce them from 10 a.m. to noon, was applied to make them comparable with the noon observations recorded on the ships out at sea. "[137]

For Bengal in Eastern India, though it was not copiously authenticated by the meteorologists regarding the accuracy of the barometric and thermometric information on which they had relied upon, but they treated them as workable and dependable. It is interesting to note that the reports on cyclones which appeared in the Western India in Arabian Sea were published from the Superintendent of Government Printing of Calcutta. This shows the impact of the colonial meteorology developed in Bengal which was later followed by the other parts of India. The cyclones in the northern Bengal region were recorded with their barometric variabilities and with the fluctuating rainfall and temperature that included the barometric account of a regular interval of every one or one and half hours of duration of record (especially in the case of 1874 cyclone) which contained detail of varying degree of cyclonic pressure at the different times of day and night. The cyclones occurred between 1864 and 1874 had been noticed with their ever changing wind direction from the meteorological observatories after their entering into the land. For western and south-western districts it was observed in 1888 when four major cyclones had visited in a single year that a prevailing shallow disturbance or barometric depression had existed over a particular area and from this area of depression a number of small storms had developed.[138] Although there was 'minimum pressure' in the Southern districts of northern Bengal but at the same time there was 'a marked tendency to the setting up of a cyclonic circulation of winds'.[139]

In the closing years of nineteenth century and the beginning of twentieth century generation of meteorological knowledge had considerable been systematized and published by the

governmental assistance. The reports of several cyclones originated in the Bay of Bengal had been compiled by the meteorologists under the title of *Handbook of Cyclonic Storms* or *Cyclone Memoirs* in several volumes. John Eliot played a crucial role towards the systematization and publication of these memoirs. The objectives of the compilations and publications of these memoirs were twofold: first to provide seamen a full statement and explanation of "the laws of storms in the Bay of Bengal" for their 'practical guidance'; and secondly, to inspire the sailors to perceive exactly and vividly the weather conditions of in the Bay of Bengal 'in the hope that they [would] send in copies of their observations to the Calcutta Meteorological Office, where…every fact likely to be of practical or theoretical use carefully noted and recorded.'[140] Government had taken keen interest in the publication of these Handbooks and Memoirs and these were published from the Superintendent of Government Printing, Calcutta. Thus the documentation on the part of the Government had provided a great impetus towards the generation of meteorological knowledge. It had been cogently mentioned by John Elliot, the Meteorological Reporter to the Government of India and Director General of Indian Observatories, that though there were plenty of theoretical discourses prevailing in the official circle of Indian meteorology but still the *Handbook* was written for the broader knowledge of the sailors 'without any reference or bias to any particular theory of cyclone generation and motion.[141] There was another implication of the publication of Handbook other than the meteorological significance. The publication of handbook produced huge demand and it increased during the time of Second World War when the handbook was published by the Government of India from Simla in an abridged form. While forwarding the abridged version of the Handbook, C. W. B. Normand, the Director General of Observatories had categorically stated that: '…this abridged edition of the Handbook…will be useful not only to the seaman, but also to the airman and the meteorologist.'[142] Despite of scientific approaches developed for the explanation of clouds during the storms, even in the late nineteenth century it was believed that 'the examination of synoptic charts can never supersede the necessity of observations on the appearance of the sky.'[143]

Conclusion

There is no doubt that meteorology both as 'science' and a 'tool' had a significant impact on the commercial activities as well as on overall economic system. But the expansion of meteorological knowledge did not contribute to the emergence of any practical understanding which could be useful for the mitigation of cyclonic hazard. In fact, the advancement on the field of meteorological knowledge was only directed to the navigational purposes. It hardly had any relevance in forecasting the cyclones for the people who resided on land. It can be said that meteorological survey and research was only confined to the interest of the colonial rulers. When cyclones had took a heavy toll in lieu of losses of human and cattle life, there was hardly any attempt to be made available the meteorological information for the common people. Whatever information about losses or casualties had been collected by the colonial government was confined only into the papers. Only the urban areas and the British settlements received greater attention during the cyclone whereas official reports were collected from all the areas which were affected by the cyclones. Thus Calcutta and Darjeeling occupied the significant position towards mitigation of cyclonic disasters. On the other hand, contradictory official reports displayed ambiguities and uncertainties prevailed in the official circles regarding the loss of life and property in the cyclones. Recovery from the situation was totally relied on the indigenous response to the disasters which demonstrated a wholesome vernacular notion of sensibilities and understanding of natural calamities. It was observed that loses were less in cases of *kutcha* houses than the *pucca* houses. Though it was confidently attributed by the colonial rulers that this could resist further losses, but the assumption was devoid of any tendency or effort on the part of the government to ameliorate poverty of the people so that they could live in a protected or well-constructed house. Materials for repairing destroyed houses could not remain cheap after the disasters, as a result of sudden increase in demand. Side by side, labour became scarce as their individual recovery required a considerable span of time and money. Rural Bengal suffered maximum during this time due to the lack of circulation of money among the villagers who themselves needed charitable support or governmental recovery programme, hardly to find any of those during or after the storm had occurred. Though there was increasing emphasis on the establishment of meteorological observatories in different parts of Bengal but the failure on the part of the colonial government in introducing better warning systems and preparedness led to the destruction of life and property in every cyclone.

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[1] Tonny Gibbs, Windstorms in Joseph P. Stoltman, John Lidstone, Lisa M. Dechano (eds.), *International Perspectives on Natural Disasters: Occurrence, Mitigation and Consequences*, Springer, Netherlands, 2007, p. 65.

[2] Ranjan Chakrabarti, The Kolkata Cyclone/Earthquake of 1737: Random Scribbles, *Vidyasagar University Journal of History*, Vol. 1, 2012-13, p. 1.

[3] The term *hurricane* is originated from the Mayan storm-God Hunraken and the Arawak word *hurican*, which meant the devil wind. The greatest death toll of all recorded hurricanes occurred from October 10-18, 1780. Nearly 20,000 people were perished as the storm hit virtually every island from Tobago in the southeast, through the Windward and Leeward Islands, and across to Hispaniola and Cuba. In the past 60 years in the Caribbean, another 20,000 people have lost their lives because of hurricanes. The pattern in recent times has been a reduction in the number of deaths and injuries due to better warning systems and preparedness. Ibid.

[4] Even in the second half of the nineteenth century the British Government had to depend heavily upon the Ship-masters and others to obtain and keep meteorological records which seemed to have of great importance to them for sailing the ships in the sea and their safe journey. The Newman's Standard Barometer which was stationed at Kandy (Ceylon), Madras, and Calcutta, was used to record barometer readings in the cyclone of October, 1864, had provided information about barometrical and thermometric data from 27th September to 1st October, 1864. The ship named *Moneka* had supplied the detail records of the cyclone. However, the atmospheric pressures prevailed in these regions and noticed by the different observatories established there were not identical rather varied so widely that it was for sometime become difficult to note this variability. But problem for the time being was overcome by deducting the statistics from maximum barometric data to the minimum.

[5] Lieut. Col. J. E. Gastrell and A. R. S. M. Henry F. Blanford, '*Report on the Calcutta Cyclone of the 5th October 1864*', Military Orphan Press, Calcutta, 1866, p. 8. (hereafter *Report on 1864 Cyclone*)

[6] *Ibid*., p. 9.

[7] *Ibid*., p. 11.

[8] *Ibid*., p. 14.

[9] *Ibid*.

[10] *Ibid*., p. 26.

[11] *Ibid*., p. 27.

[12] 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. 298.

[13] Mr. Blechynden's account for the *Englishman* Newspaper. *Report on 1864 Cyclone*, pp. 63-64.

[14] *Ibid*., p. 64.

[15] *Ibid*.

[16] *Ibid*.

[17] *Ibid*., p. 65.

[18] *Ibid*.

[19] C. E. Buckland, *op. cit*., vol. I., p. 298.

[20] *Report on 1864 Cyclone*, pp. 65-66.

[21] *Ibid*., p. 66.

[22] *Extract from a letter from the Assistant Superintendent of Bograh, to the Deputy Inspector – General of Police, No. D., dated 6th Oct. 1864*, Progs. No. 10., Proceedings of the Hon'ble the Lieutenant Governor of Bengal during November, 1864. (General Department). West Bengal State Archives, Kolkata (hereafter WBSA).

[23] J. N. Gupta, *District Gazetteers of Eastern Bengal and Assam: Bogra*, Pioneer Press, Allahabad, 1910, p. 74.

[24] L. S. S. O'Malley, *Bengal District Gazetteers: Pabna*, Bengal Secretariat Book Depot., Calcutta, 1923, p. 46.

[25] *Report on 1864 Cyclone*, p. 67.

[26] *Ibid*., p. 69.

[27] *Ibid*., p. 70.

[28] *Ibid*., p. 93.

[29] *Ibid*., p. 71.

[30] *Ibid*., p. 74.

[31] C. E. Buckland, op. cit., vol. I., p. 300.

[32] *From A. B. Falcon, EsQ., Officiating Magistrate of Bograh, to the Commissioner of the Rajshahi Division, - (No. 136, dated the 6th October, 1864),*., Proceedings of the Hon'ble the Lieutenant Governor of Bengal during November, 1864. (General Department). Progs. No. 10, WBSA.

[33] *Extract from a letter from the Assistant Superintendent of Bograh, to the Deputy Inspector – General of Police, No. D., dated 6th Oct. 1864.), Progs. No. 10*., WBSA.

[34] The police-returns from different *thanas* of the Rajshahi District had reported the following number of deaths caused by the cyclone in the district: Beauleah – 5, Tannore – 3, Bhowanigunj – 7, Bilmariah – 14, Poothea – 24, Charghat – 10, Nattore – 26, Singrah – 37, Boraigaon – 21. The total number of death was 147 and the largest numbers of deaths were occurred at the *thana* of Singrah (37). *Report on 1864 Cyclone*, pp. 138-139.

[35] L. S. S. O'Malley, *Bengal District Gazetteers: Pabna,* p. 46.

[36] "The centre of the storm having traversed the country stretching nearly due east from Calcutta to Basirhat on the Ichamati river. In this line many villages were blown down wholesale, and their destruction was accompanied by much loss of human life. Baruipur, Diamond Harbour, Atharabanka, Basirhat, Gobardanga and Satkhira had suffered severely. The storm-wave beginning from Saugor Island extended a very great distance to the extreme east of the district of 24 Parganas, and in the Kulpotton and Kobadak rivers the water rose to 6 feet above the flood level. The storm was severely felt in Jessore and Nadia and as far as Dacca and Backergunge." C. E. Buckland, op. cit., pp. 407-8.

[37] *Memorandum from W. Wavell, EsQ., Officiating Collector of Bograh, to the Commisioner of the Rajshahye Division, - (No. 134, dated Bograh, the 4th Nov. 1867).* Proceedings of the Hon'ble the Lieutenant Governor of Bengal during April, 1868 (General Department). Progs. No. 102., WBSA.

[38] *Ibid*.

[39] *From H. F. J. Kean, EsQ., Officiating Collector of Dinagepore, to the Secretary to the Board of Revenue, Lower Provinces, - (No. 257, dated Dinagepore, the 11th November, 1867).*

Proceedings of the Hon'ble the Lieutenant Governor of Bengal during April, 1868 (General Department). Progs. No. 103, WBSA.

[40] *Ibid*.

[41] *Ibid*.

[42] *From P. A. Humphery, EsQ., Deputy Collector of Rajshahye, to the Secretary to the Board of Revenue, Lower Provinces, - (No. 6, dated Beauleah, the 13th November 1867)*. Proceedings of the Hon'ble the Lieutenant Governor of Bengal during April, 1868 (General Department). Progs. No. 106, WBSA.

[43] *Ibid*.

[44] *Ibid*.

[45] *From the Deputy Magistrate and Collector of Rajshahye, to the Commissioner of …….(No. 254, dated Beauleah, the 20th November 1867)* Proceedings of the Hon'ble the Lieutenant Governor of Bengal during April, 1868 (General Department). Progs. No. 108, WBSA.

[46] *From W. L. Heeley, EsQ., Magistrate of Rajshahye, to the Commissioner of the Rajshahye Division, - (No. 86, dated Rajshahye, the 11th June 1869),* Proceedings of the Hon'ble the Lieutenant-Governor of Bengal during September, 1869 (General Department), Progs. No. 157, WBSA.

[47] *From C. E. Lance, EsQ., Officiating Commissioner of the Rajshahye Division, to the Secretary to the Government of Bengal, - (No. 269, dated Berhampore, the 15th June 1869.),* Proceedings of the Hon'ble the Lieutenant-Governor of Bengal during September, 1869 (General Department), Progs. No. 157, WBSA.

[48] *From W. Le F. Robinson, EsQ., Officiating Commissioner of the Rajshahye Division, to the Junior Secretary to the Government of Bengal, - (No. 134 Ct., dated Camp Rungpore, the 29th January 1868)* Proceedings of the Hon'ble the Lieutenant Governor of Bengal during May, 1868 (General Department), Progs No. 66, WBSA

[49] *Ibid*.

[50] *Ibid*.

[51] *From W. V. G. Tayler, EsQ., Collector of Pubna, to the Commissioner of Rajshahye Division, - (No. 505, dated Pubna, the 23rd November 1867),* Proceedings of the Hon'ble the Lieutenant Governor of Bengal during April, 1868 (General Department). Progs. No. 111, WBSA.

[52] *Ibid*.

[53] *Ibid*.

[54] *From W. Le F. Robinson, EsQ., Officiating Commissioner of the Rajshahye Division, to the Junior Secretary to the Government of Bengal, - (No. 134 Ct., dated Camp Rungpore, the 29th January 1868)* Proceedings of the Hon'ble the Lieutenant Governor of Bengal during May, 1868 (General Department), Progs No. 66, WBSA.

[55] *Ibid*.

[56] *Ibid*.

[57] *Ibid*.

[58] *From W. LE F. Robinson, EsQ., Officiating Commissioner of the Rajshahye Division, to the Secretary to the Board of Revenue, Lower Provinces, - (No. 20t., dated Camp Maldah, the 11th November 1867),* Proceedings of the Hon'ble the Lieutenant Governor of Bengal during April, 1868 (General Department), Progs. No. 101, WBSA.

[59] *Ibid*.

[60] The cyclone had brought havoc to the life and property in the Presidency Division of which the districts of 24 Parganas, Jesore and Nuddea had to face the largest destruction.

Districts	Loss of Life	Loss of Cattle	Destruction of Houses
24 Parganas	3,628	36,318	4,10,054
Jessore	126	11,735	2,74,432
Nuddea	180	12,556	1,27,917
Total	3,934	60,609	8,12,403

Amiya Kumar Bagchi and Arun Bandopadhyay (eds.), *Documents on Economic History of British Rule in India, 1858-1947: Eastern India in the Late Nineteenth Century, Part I: 1860s-1870s,* Manohar, New Delhi, 2009, p. 98.

[61] *From Colonel J. C. Haughton, C. S. I., Commissioner of the Cooch Behar Division, to the Officiating Secretary to the Government of Bengal. – (No. 267, dated Julpigoree, the 3rd*

October 1872), Proceedings of the Hon'ble the Lieutenant-Governor of Bengal during October 1872 (General Department: Industry and Science Branch), Progs. No. 22, WBSA.

[62] The then Junior Secretary of Bengal had instructed the Commissioner of the Rajshahi Division to 'furnish an immediate report as to the damage' caused by the cyclone of September, 1872 in the *thana* of Serajgunj and the district of Bogra of Rajshahi Division. *From J. Ware Edgar, EsQ., the Officiating Junior Secretary to the Government of Bengal, to the Commissioner of the Rajshahye. – (No. 3532, dated Calcutta, the 1st October 1872),* Proceedings of the Hon'ble the Lieutenant-Governor of Bengal during October 1872 (General Department: Industry and Science Branch), Progs. No. 38, WBSA.

[63] *From T. F. Bignold, EsQ., Officiating Magistrate of Bograh, to the Commissioner of the Rajshahye Division, Berhampore. – (No. 946, dated Bograh, the 1st October 1872,* Proceedings of the Hon'ble the Lieutenant-Governor of Bengal during October 1872 (General Department: Industry and Science Branch), Progs. No. 41, WBSA.

[64] *Ibid*.

[65] *Ibid*.

[66] *Ibid*.

[67] *Ibid*.

[68] *From P. Nolan, EsQ., Assistant Magistrate of Serajgunge, to the W. V. G. Tayler, EsQ., Magistrate of Pubna. – (No. 396, dated Serajgunge, the 26th September, 1872)*, Proceedings of the Hon'ble the Lieutenant-Governor of Bengal during October 1872 (General Department: Industry and Science Branch), Progs. No. 43, WBSA.

[69] *Ibid*.

[70] *From W. D. Pratt, EsQ., District Superintendent of Police, to the Magistrate of Pubna. – (No. 913, dated Pubna, the 6th October, 1872)*, Proceedings of the Hon'ble the Lieutenant-Governor of Bengal during December 1872 (General Department: Industry and Science Branch), Progs. No. 11, WBSA.

[71] *Memorandum by the Officiating Commissioner of the Rajshahye Division. – (No. 249, dated Berhampore, the 28th September 1872.),* Proceedings of the Hon'ble the Lieutenant-Governor of Bengal during November 1872 (General Department: Industry and Science Branch), Progs. No. 17, WBSA.

[72] L. S. S. O'Malley, *Bengal District Gazetteers: Pabna,* p. 46.

[73] There were four large *bheels* (water bodies) in the district of Pabna viz. the Challun, Gozna, Borra, and Demra Bheels. These *bheels* were planted with rice, and average depth was 10 feet or 15 feet. Rice crop in these *bheels* had suffered extremely due to excessive wind and rain during the cyclone. *From W. D. Pratt, EsQ., District Superintendent of Police, to the Magistrate of Pubna. – (No. 913, dated Pubna, the 6th October, 1872)*, Proceedings of the Hon'ble the Lieutenant-Governor of Bengal during December 1872 (General Department: Industry and Science Branch), Progs. No. 11, WBSA.

[74] *Ibid*.

[75] *Ibid*.

[76] W. G. Wilson, *Report on the Midnapore and Burdwan Cyclone of the 15th and 16th of October 1874*, Bengal Secretariat Press, Calcutta, 1875. (Hereafter - *Report on the Cyclone of 1874*).

[77] In 1874, the rainfall in the Lower Bengal was not only scanty but it was unseasonably distributed in Bengal with an unprecedented increase in occurrence of storms and cyclones in the month of August. Other parts of India (Central Provinces, N. W. Provinces and Bihar) had witnessed good quantity of rainfall. The period from 10th to 14th of October was mostly 'rainless' all over Bengal with occasional showers at some places and the weather became gradually warm. *Report on the Cyclone of 1874,* p. 13.

[78] *Ibid*. p. 43.

[79] The district of Midnapur had to witness the maximum destruction in terms of loss of human lives and cattle, though the other parts of the southern Bengal had also to undergo with severe damage 'but by no means [were] equal to the injury done at Midnapore' . There had been total 3,049 human deaths and 17,500 cattle were perished in the whole district of Midnapur. From station of Midnapur the cyclone had passed over Ghatal and Jahanabad to the station of Burdwan and in the Burdwan district 21,000 houses were destroyed and 29 human deaths were occurred. For more details see 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. 621.

[80] For details see Collection No. 4-34 and Collection No. 4-35 of *Proceedings of the Hon'ble the Lieutenant-Governor of Bengal during January 1875* (General Department), WBSA.

[81] [Collection No. 4. – 38/39] *From Baboo Brojo Kant Rae, Deputy Collector, to the Officiating Collector of Rungpore. –(No. 141, dated Gyebunda, the 30th October 1874),* Proceedings of the Hon'ble the Lieutenant-Governor of Bengal during January 1875 (General Department), WBSA.

[82] *Report on the Cyclone of 1874,* p. 78.

[83] [Collection No. 4. – 38/39] *From Baboo Brojo Kant Rae, Deputy Collector, to the Officiating Collector of Rungpore. –(No. 141, dated Gyebunda, the 30th October 1874)*.

[84] [Collection No. 4. – 38/39] *From Baboo Krishto Dhone Ghose, M.D., Civil Surgeon of Rungpore, to the Magistrate of Rungpore. – (No. 402, dated Rungpore, the 31st October 1874),* Proceedings of the Hon'ble the Lieutenant-Governor of Bengal during January 1875 (General Department), WBSA.

[85] *Report on the Cyclone of 1874,* p. 77.

[86] [Collection No. 4. 36/37] *From Dr. A. Lyons, Civil Medical Officer, Bogra, to the Magistrate of Bogra (No. 1222, dated Bogra, the 27th October 1874),* Proceedings of the Hon'ble the Lieutenant-Governor of Bengal during January 1875 (General Department), WBSA.

[87] *Report on the Cyclone of 1874.,* pp. 77-78.

[88] [Collection No. 4. 36/37] *From Dr. A. Lyons, Civil Medical Officer, Bogra, to the Magistrate of Bogra (No. 1222, dated Bogra, the 27th October 1874).*

[89] [Collection No. 4- 29/30] *From Baboo Dwarka Nath Chatterjee, Civil Medical Officer, to the Magistrate of Maldah (No. 155, dated Maldah, the 28th October 1874)*, Proceedings of the Hon'ble the Lieutenant-Governor of Bengal during January 1875 (General Department), WBSA.

[90] [Collection No. 4- 29/30] *From F. Wyer, EsQ., Officiating Collector of Maldah, to the to the Secretary to the Government of Bengal, in the Statistical Department, (No. 534, dated Maldah, the 29th October 1874)*, Proceedings of the Hon'ble the Lieutenant-Governor of Bengal during January 1875 (General Department), WBSA.

[91] *Ibid*.

[92] *Report on the Cyclone of 1874.,* p. 75.

[93] *Ibid*.

[94] [Collection No. 4. 31/32] *From W. H. Doyly, EsQ., Collector of Rajshahye, to the Assistant Secretary to the Government of Bengal, Statistical Department. – (No. 2904, dated Beauleah, the*

29th October 1874), Proceedings of the Hon'ble the Lieutenant-Governor of Bengal during January 1875 (General Department), WBSA.

[95] *Report on the Cyclone of 1874.,* pp. 75-76.

[96] [Collection No. 4. 31/32] *From W. H. Doyly, EsQ., Collector of Rajshahye, to the Assistant Secretary to the Government of Bengal, Statistical Department. – (No. 2904, dated Beauleah, the 29th October 1874)*. (WBSA)

[97] *Report on the Cyclone of 1874,* p. 71.

[98] *Ibid*.

[99] *Ibid*.

[100] [Collection No. 4-26] *From W. Wavell, EsQ., Officiating Magistrate and Collector of Moorshedabad, to the Secretary to the Government of Bengal, Scarcity and Relief Department, Darjeeling. – (No. S.R. – H.D., dated Berhampore, the 17th October 1874)*, Proceedings of the Hon'ble the Lieutenant-Governor of Bengal during January 1875 (General Department), WBSA

[101] *Ibid*.

[102] *Report on the Cyclone of 1874*, p. 73.

[103] [Collection No. 4. – 40/41] *From W.Wavell, EsQ., Officiating Collector of Moorshedabad, to the Assistant Secretary to the Government of Bengal. – (No. 324Ct., dated Camp Khurgaon, the 21st November 1874.)* Proceedings of the Hon'ble the Lieutenant-Governor of Bengal during January 1875 (General Department), WBSA.

[104] For more details see J. Elliott, *Report of the Vizagapatam and Backergunge Cyclones of October1876*, Bengal Secretariat Press, Calcutta, 1877.

[105] *Papers on the Subject of the Bengal Cyclone and Storm-wave of the 31st October – 1st November1876 and the Subsequent Cholera Epidemic*, George Edward Eyre and William Spottiswoode, London, 1877, p. 2.

[106] Harendra Narayan Chaudhury, *The Cooch Behar State and its Land Revenue Settlements*, Cooch Behar State Press, Cooch Behar, 1903, p. 79.

[107] The Annual Administration Report of the Cooch Behar for the year 1886-87, cited in *The Cooch Behar State and its Land Revenue Settlements*, p. 80.

[108] *Ibid*.

[109] G. E. Lambourn, *Bengal District Gazetteers: Malda*, Bengal Secretariat Book Depot, Calcutta, 1918, p. 57.

[110] *Ibid*.

[111] L. S. S. O'Malley, *Bengal District Gazetteers: Darjeeling*, Bengal Secretariat Book Depot., Calcutta, 1907, p. 129.

[112] *Ibid*.

[113] *Darjeeling District Gazetteer: Statistics, 1901- 02*, Calcutta, 1905, p. 3.

[114] E. C. Dozey, *A Concise History of the Darjeeling District since 1835 with a Complete Itinerary Tours in Sikkim and the District*, Calcutta, 1922, pp. 140 - 41.

[115] *The Fairfield News and Herald*, Winnsboro. S. C., Wednesday, October 4, 1899. Vol. LIV, No. 8.

[116] Kole (in Nov. 1867) and Serajgunge (in Sept. 1872) of the district of Pubna and the whole of Darjeeling district (in 1899) had to suffer a loss of huge amount of commodity like – sugar, paddy, wheat, indigo, jute, salt, tea, timber etc.

[117] Cited in Tirthankar Roy, *Natural Disasters and India History*, Oxford University Press, New Delhi, 2014 (second impression), p. 112.

[118] Greg Bankoff, Winds of Colonization, The Meteorological Contours of Spain's Imperium in the Pacific 1521-1898, *Environment and History*, 12, 2006, p. 66.

[119] The process of collection of meteorological data in Great Britain was started centuries ago when Royal Observatory at Greenwich was constructed in 1675 for the purpose of astronomy and navigation. Later developments were followed by the introduction of new technologies and methods to clarify and analysis of meteorological figures. The Observatory practice of using young boys as computers was introduced by Airy in the 1830s to deal with a backlog of astronomical data. Computers were frequently recruited from the Roan School and also from the Bormann Foundation School attached to the Naval College. The entrance examination for computers involved writing from dictation to test hand-writing, spelling, punctuation, arithmetic, including extraction of square roots and the use of logarithms, and algebra to quadratic equations. Joan M. Kenworthy, *Albert Walter, O. B. E. (1877-1972): Meteorologist in the Colonial Service, Part I: His Early Life and Work in Mauritius*, Occasional Paper, Royal

Meteorological Society, 2013, p. 6. For more details see Albert Walter, Echoes of a Vanishing Empire, being the Memoirs of a Meteorologist and Civil Servant in the Colonial Empire 1897-1947, Volume I, 1963.

[120] R. K. Kochar, *Science in British India. I. Colonial Tool*, Current Science, Vol. 63, No. 11, 10 December 1992, p. 691.

[121] *Report on the Cyclone of 1874,* p. 81.

[122] *Ibid*.

[123] *Ibid*., pp. 82-83.

[124] Tirthankar Roy, 'The Law Of Storms': European and Indigenous Responses to Natural Disasters in Colonial India, C. 1800–1850, *Australian Economic History Review*, Vol. 50, No. 1, March 2010, p. 8.

[125] Cited in J. Elliott, *Report of the Vizagapatam and Backergunge Cyclones of October1876*, p. 3.

[126] Lieut. Colonel W. Reid, *An Attempt to Develop the Law of Storms by Means of Facts, arranged according to place and time; and hence to point out a cause for the Variable Winds with the view to Practical Use in Navigation*, John Wale: Library of Civil, Military, and Mechanical Engineering, London, 1838.

[127] *Ibid*., p. 2.

[128] W. H. Drove, *The Law of Storms: Considered in Connection with the Ordinary Movements of the Atmosphere*, translated by Robert H Scott, Longman, London, Second Edition,1862, p. 3.

[129] For detail see H. Piddington, A Seventeenth Memoir on the Law of Storms in India; being Storms of the China Seas from 1842–1847, and Some of the Northern Pacific Ocean from 1797, *Journal of the Asiatic Society of Bengal*, 18, 1849, pp. 1–45.

[130] Cited in Pratik Chakraborty, The Asiatic Society and its Vision of Science: Metropolitan Knowledge in a Colonial World, *Calcutta Historical Journal*, Vols. XXI & XXII, 1999-2000, P. 7.

[131] Cited in J. Elliott, *Report of the Vizagapatam and Backergunge Cyclones of October1876*, p. 4.

[132] *Ibid*.

[133] For detail see Sir John F. W. Herschel, *Meteorology*, Adam and Charles Black, Edinburgh, 1861.

[134] *Ibid*., pp. 5-6.

[135] Government was very much choosy in terms of spending money for the temporary meteorological observatories and 'to limit their expenditure' it was restrained itself from investing any extra amount other than the amount budgeted for. For details see From H. L. Harrison, EsQ., Junior Secretary to the Government of Bengal, to the Secretary to the Meteorological Committee, - (No. 2644, dated Fort William, the 30th May 1868), Progs No. 117, *Proceedings of the Hon'ble the Lieutenant Governor of Bengal (General Department)* Fort William, May, 1868, WBSA.

[136] From H. F. Blanford, EsQ., Secretary to the Meteorological Committee, to the Junior Secretary to the Government of Bengal, - (No. 398, dated the 5th May 1868), Progs No. 118, *Proceedings of the Hon'ble the Lieutenant Governor of Bengal (General Department)* Fort William, May, 1868, WBSA.

[137] The Cyclone of the 25th May to the 2nd June 1881 in the Arabian Sea (VIII) in *Indian Meteorological Memoirs being Occasional Discussions and Compilations of Meteorological Data relating to India and the Neibouring Countries*, Vol. IV, Part. V, Superintendent of Government Printing, Calcutta, 1888, pp. 261-262.

[138] Alexander Pedler, Account of the Cyclonic Storm of August 21st to 28th, 1888 in J. Eliot, *Cyclone Memoirs Part II: Bay of Bengal Cyclone of August 21st – 28th, 1888*, Superintended of Government Printing, Calcutta, 1890, p. 48.

[139] *Ibid*., p. 49.

[140] John Eliot, *Handbook of Cyclonic Storms in the Bay of Bengal for the use of Sailors*, Superintendent of Government Printing, Calcutta, 1890, Preface.

[141] John Elliot, *Handbook of Cyclonic Storms in the Bay of Bengal for the Use of Sailors, Vol. I – Text*, Superintendent of Government Printing, Calcutta, 1900, second edition, p. i.

[142] *India Meteorological Department: The Handbook of the Cyclonic Storms in the Bay of Bengal for the Use of Sailors (Abridged),* by Sir John Eliot, Manager: Government of India Press, Simla, 1944.

[143] Cited in Tirthankar Roy, *Natural Disasters and India History*, p. 102.