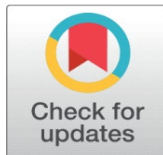


# FROM OBSERVATIONS TO INSTITUTIONS: RISE OF METEOROLOGICAL SCIENCE IN COLONIAL BENGAL, 1784 – 1905

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## ABSTRACT

The last few decades have witnessed flowering of interest in the history of western science in colonial India. The study of the knowledge forms of non-western societies is a rapidly emerging research field that could have a lasting impact on the disciplinary history of science (Raina, 2010, p.1). The present paper tries to explain the nature of the development and evolution of the modern meteorological science in colonial Bengal, to explore the complex relationship between science and colonisation.

**Keywords:** Meteorology, Colonial Science, Institutionalization

## 1. INTRODUCTION

Meteorology is the science of the atmosphere, or, with a certain limitation of meaning, the study of weather (Shaw, 1926, p.1). The relationship between the people and the weather has been established in the early periods itself. Human beings live under the umbrella of atmosphere and interact with it constantly. Modern researches have shown that in pre-colonial period, India's indigenous people had rich knowledge about weather, cloud or rain cloud, lightning and also natural hazards like, storms, flood famines etc (Roy et al., 1997, pp.112-114). In ancient cultures throughout the world weather was believed to be controlled by gods, stars and spirit powers. In India the principal weather deities described in the Rig Vedic literatures were : Varuna for sky, Marut for wind, Parjanya for rain cloud and Indra for lightning (Roy et al., 1997). A. S. Ramanathan has shown in a research paper that the post- Vedic scholars fully recognised the need for collection of meteorological data for understanding the performance and vagaries of the monsoon (Ramanathan, 1987, pp.277-285). However, the modern weather observation mechanism was broadly emerged in European metropolis during the seventeenth and eighteenth centuries. It was mainly depended on the laws of modern core sciences and

scientific instruments. Perhaps we can be exhibited the differences between modern European and India's traditional knowledge system about weather by saying that the first was predominantly more quantitative than the latter. Even the modern meteorological science which developed in colonial India, was far more systematic, methodological, discerning and observing than India's pre-colonial weather observation system. The inventions of weather observing instruments since the seventh centuries Europe performed a great role in the emergence of modern meteorological science, because they helped to quantify the weather, to break down its various aspects, for instance temperature, atmospheric pressure, humidity, wind force and so forth into measurable units. Modern meteorological observations emerged in India under colonial rule. It had started its journey in Bengal with the beginning of East India Company's rule in Bengal, Bihar and Orissa.

Present paper concentrates on Bengal because it was the first province to be transformed under British administration and the most valuable part of the Indian subcontinent before the twentieth century. Even it also the main centre of the meteorological observations throughout the British India till 1905. Modern meteorological science evolved in Bengal at the initiative of the colonial rulers, who encouraged it with a view to furthering colonial interest. In Bengal meteorology developed as a government sponsored science and its aims were decided on the field of economic and administrative profit.

Present article is not an investigation into scientific works in meteorology or an experience in pure scientific understanding. It does not delve into laboratory experiments or results. However, it tries to evaluate them in the context of political, economic and social influence. It mainly focuses on the issues of why and how modern weather observing science was introduced and institutionalised in colonial Bengal in particular and India in general. It briefly discusses and analyses the beginning of meteorological science in late eighteenth century Bengal and its gradual maturation. It also shows how meteorological science organised in East India Company's period and how its nature changed under the rule of the Raj. It also examines the history of the formation, ideas, organisation, scientific and academic activities of both Bengal Provincial meteorological office, which was established in 1867 at Calcutta, and India Meteorological Department, which was established in 1875 with its headquarter at Alipore, Calcutta, and their contributions in colonial science. To shed light on the nature of the activities of the both Provincial Meteorological Office of Bengal and the Alipore central meteorological observatory of IMD, present research tries to show that the imperial scientific institutions helped to shape the science policies of the colonial rulers. Present article emphasises to locate the activities of the Indian particularly Bengali meteorological observers of the IMD and tries to show how Indians responded to modern weather science.

## 1.1. OBJECTIVES, RESEARCH QUESTIONS AND METHODOLOGY

The diffusion of modern meteorological science under British rule in Bengal, in particular, and India, in general, is one of the most important, yet neglected topics in the history of India. The development of colonial meteorological science in Bengal had massive economic and cultural impact on colonial society. Nevertheless, scholars do not pay much of their attention on this issue. Present article tries to build a bridge for filling this gap. The study concerns the process of institutionalisation of meteorological science in colonial Bengal, in particular, and India, in general, and the nature and directions of such developments. Science had considerably influenced the coloniser's patterns of shaping the socio-economic and political structure of colonial India and created necessary conditions that supported expansion, consolidation and exploitation. This work is an effort to understand the role of meteorological science under colonial situation in shaping and reshaping the field of weather observation in colonial India in the context of Bengal. Under colonial situation, meteorological science did not act as an independent agency and was not a fully – grown up institution. Present paper can help to guarantee a better understanding of the nature of British colonial science policy and the complex way of its implementation in the Indian subcontinent.

Present paper humbly helps to trace and find answers to some questions, for instance, how did modern meteorological science emerge in Bengal ? ; What was the shape that western meteorological science took in a periphery (colonial Bengal) ? ; What was the relation between modern meteorological science and the British empire ? ; What political and historical processes drove the institutionalisation of meteorological science in colonial India ?

For investigating the research questions of the present article, I have depended specially on the primary sources, particularly archival documents, official reports, contemporary journals and contemporary tracts and publications.

## 2. LITERATURE REVIEW

Jim Burton has opined that historians of science have shown little interest in meteorology (Burton, 1986). However, some scholars of Europe and America, have written various papers on meteorology where they primarily concentrate on the development of meteorological science in European and American metropolises. For instance, Jim Burton has analysed the development of storm investigations and maritime meteorology in the first half of the nineteenth century England and the foundation of Meteorological Department of the Board of Trade (Burton, 1986). Katharine Anderson underlines the importance of 'structure' and 'institutions' as heuristic tools in studying the growth of modern meteorological science in Victorian age (Anderson, 2005). Drawing on methods from the sociology of knowledge, she explains how weather featured in discourse and posturing upon the cultural stage. Huib J. Zuidervaat has shown the development of Medical-Meteorological Society in eighteenth century Netherlands (Zuidervaat, 2005, pp. 379-410). In his research paper he has described how the first meteorological network organised in eighteenth century Netherlands for collecting weather information and how an early meteorological society, the *Natuur en Geneeskundige Correspondentie Societeit* (1779-1802), was established. His paper tries to answer to some questions, for instance : What were the factors that triggered this interest in the weather in the Netherlands ? ; What were the goals and expectations of the contributors ? His paper helps to understand how scientific infrastructure of the old eighteenth century Dutch Republic and the lack of proper theoretical insight were also crucial factors that eventually frustrated the breakthrough of Meteorology as an academic science in the Netherlands. Catharine Ward and Julian A. Dowdeswell has analysed the meteorological records from about thirty British Navy ships that overwintered in the Canadian Arctic islands between 1818 and 1859 (Ward et al., 2006, pp.454-464). This paper helps to understand the type of meteorological instruments and the observational methods employed aboard these ships. Simon Naylor has discussed the development of a quantified, standardized and institutionalized meteorological science in the nineteenth century Britain, one that relied on sophisticated instrumentation and highly regulated observers and techniques of observation in its attempt to produce an accurate picture of the national wealth (Naylor, 2006, pp. 407-433). In his research papers, Jeremy Vetter has concentrated to examine the role of lay observers, field network and telegraph lines in meteorological researches in particularly Kansas city and USA in general (Vetter, 2012, pp. 259-280).

Last few decades the history of modern meteorological science is going to be attractive when scholars have concentrated to analyse the nature and evolution of modern meteorology in colonial contexts and its impact on colonial society, economy, culture and politics. Scholars have examined the relationship between prevailing weather systems and colonialism (Bankoff, 2006, pp. 65-88). They have analysed how European meteorologists and colonial meteorological institution played a crucial role in the constitution and articulation of modern science in the European colonies and how the traditional meteorological knowledge of the colonial society is different from science practised in the non colonial context (Huber et al., 1997, pp. 577-597) They also concentrate on the commercial nature of meteorological science (Randalls, 2010, pp. 705-730).

However, historians and scholars of science have paid very little attention to explore the development and evolution of modern meteorological science in colonial India and its massive economic and cultural impact on colonial India's society.

In his influential book *Science and The Raj : 1857-1905*, Deepak Kumar has discussed how the history of India during the last century spectacularly illustrates a close link between science and the Raj (Kumar, 1997). His book seeks to explore the development of science in a colonial situation, its social implications and its economic ramifications. He has discussed in this book separately the main areas of activity introduced during colonial rule, surveying the land, geology, botany, medicine, engineering, meteorology, zoology, science education, scientific research and scientific institutions. Here he emphasised to trace the overall science policy of the Raj. He uses some issues for instance, the institutionalisation of meteorological science, meteorological researches, for understanding the nature of colonial science.

Pratik Chakrabarti, for instance, begins his book, *Western Science in Modern India, Metropolitan Methods, Colonial Practices* by questioning, how such a journey from centre to periphery influenced the constitution of science, and what the new meanings science received from the centre may have had in the periphery ? (Chakrabarti, 2010). His book is about science in colonial India. His investigation of science, technology and development in India has been undertaken within the frames of the politics of knowledge, centre and periphery and metropolis and province. He has shown how

science and scientific enterprises have helped colonial expansion. By his significant discussion about the journey of western science in Modern India, he has tried to understand the transmission of science in a colonial world. For understanding the nature of the expansion of European sciences into colonial India, he writes some lines in his book on the activities of the early amateur meteorologists.

In his significant book *Science, Technology and Medicine in Colonial India*, David Arnold has written a few pages indicating how meteorological science was developed under the English East India Company and how it functioned under colonial state (Arnold, 2007). His study helps us to understand the nature of colonial science. It gives an outline of the growth of meteorological science in colonial India.

Particularly one important study at this juncture is that of D. R. Sikka, who has written a chronological narrative about India Meteorological Department and provided a summary of the developments of meteorological science in colonial India. He concentrates to discuss the development of meteorology in the scientific era between mid-seventeenth century to the mid-twentieth century (Sikka, 2011). In an article, N. Sen and K. Prasad have discussed the overall development of meteorological science from ancient to post-colonial India (Sen Roy et al., 1997). In her doctoral research, Sweta Dutta, has discussed in detail about the various natural occurrences during 1770 to 1943 (Dutta, 2013). She has largely emphasized on the social impact of these occurrences and the subsequent response of the state. In her research, she has shown some weather hazards, like cyclone, famine etc.

Although, in the existing literature on modern meteorological science and colonialism in India, not much attempt has been made to study broadly the development and evolution of meteorological science in colonial Bengal, in particular and India in general, during late eighteenth century to early twentieth century, and its massive economic and cultural impact on colonial society. Scholars neglect to study empirically the formation, ideas, organisation and activities of the Calcutta Meteorological Observatory, Bengal Provincial meteorological office and India Meteorological Department. They do not pay much of their attention for analysing the close relation between colonial meteorology and the British empire. They do not properly explore how meteorological science had entered a distinct phase after the end of the Company's rule in Bengal in particular and India in general. Present article attempts to fill these research gaps.

### 3. EARLY METEOROLOGICAL OBSERVATIONS IN BENGAL (1784-1857)

Early meteorological observations in colonial Bengal gradually developed under colonial constraints. The diverse characters of the weather of Bengal in particular and India in general, were predicted and conceptualised by the British and other European observers during East India Company's period.

During this period, Bengal's physical environment became increasingly subject to the scientific activities of amateur naturalists. Simultaneously, the Asiatic Society of Bengal, founded in 1784 at Calcutta, helped in blossoming the science of meteorology in Bengal and the huge published papers on the meteorology in Society's journals were successful to stimulate the colonizer's interest for the further advancement of the meteorological predictions in colonial India.

East India Company played an important role in institutionalising colonial meteorological knowledge by introducing meteorological observatories. Deepak Kumar wrote the Company was well aware of the importance of 'Astronomy, Geography and Navigation' in India, and so observatories were established in Madras, Bombay, Calcutta, Trivandrum, Simla, Ootacamund and Karachi in the years 1792, 1823, 1829, 1836, 1841, 1847 and 1852, respectively (Kumar, 1997).

However, during the Company's rule meteorological investigations began on a small scale in Bengal and Company did not pay much of their attention for the systematic development of this particular science till 1820s. In 1829 the Company established Calcutta observatory for gathering weather information about the eastern parts of their empire (Waugh, 1968, p. 356). Meteorological observations in the government observatory at Calcutta suffered from various obstacles, for instance, lack of specialist meteorologists, faulty instruments, absence of any standard method of work. EIC had want to collect weather information for fulfilling their imperial needs. They believed the policy of low investment and high profit. They followed this equation and did not pay proper attention for the recruitment of specialist meteorologists. In the late eighteenth and early nineteenth century, EIC basically depended for the meteorological information on the Surveyors of Survey of India who were instructed to keep daily meteorological observations, both in field and office, as a part of their duty (Phillimore, 1950, pp.10-31). Some of them maintained a record book for noting their daily weather observations. For maintaining this records, the Company did not pay extra wages to them. Even, EIC used the local districts administrative officers, medical practitioners, for predicting weather and maintaining a record book in this respect. However it cannot be ignored that they were not professional or trained meteorologists.

Majority of the meteorological scientific efforts during the this period took place on the Asiatic Society's platform. Asiatic Society was not a specialist meteorological scientific institution but it provided the early base for the further progress of the weather predicting system in Bengal. Meteorological observations in the late eighteenth and the first half of the nineteenth century, initiated by the early colonial weather observers (Chakrabarti, p.34-41), took a concrete shape with the introduction of Provincial meteorological offices throughout India and later with the establishment of India Meteorological Department (1875). Side by side, the important attempt of the Asiatic Society laid foundation of the future specialist meteorological institution in India.

#### 4. INSTITUTIONALISING REGIONAL WEATHER (1858 - 1874)

After 1857, meteorological observations throughout India had penetrated a different phase under the rule of British Crown. At first the colonial government introduced 'provincial system' of meteorological observations which helped to establish the 'Office of the Meteorological Reporter' of Bengal (Phillimore, volume IV, 1958, p.120). During this period different classes of meteorological stations throughout Bengal were established for collecting local weather information. Local meteorological data was accumulated by the local observers. Their activities were coordinated and directed by the headquarter of the provincial meteorological office of Bengal (Hundred Years of Weather Service, 1976, p.16).

The Revolt of 1857 against the Company's rule and its repercussions resulted in the suspensions of meteorological observations over most of the country during the years 1857 to 1860 (Hundred Years of Weather Service, 1976, p.16). However, after the takeover of the Indian administration by the British Crown from EIC, the colonial government showed much interest in the meteorological observations for running their imperial machine more smoothly. In 1861, British government had sent a scientific mission with the help of a German Company for collecting weather centric information about India. A large portion of the rainfall and meteorological registers collected by the Medical and Revenue Departments were made over to the representatives of this company in the year 1861 to 1863. These data and registers were carried by them to Munich (Germany) but, apparently, no useful scientific results were derived from these due to disparities in instruments, exposure, and times of recording observations. However, it can be said that during this period, colonial government did not take any prominent policies for the betterment of the meteorological prediction system throughout India.

Although, during the period between 1857 to 1864, some steps were being taken by the Asiatic Society with a view to improve and systematize the work of meteorological observations, and to make it practical as well as scientific in its objects and aims. The Society formed a 'Meteorological Committee' under the supervision of Col. R. Strachey in 1857 (Proceedings of the Asiatic Society of Bengal, 1865, p.601). Committee prepared the draft of a report in 1862 where they emphasized on the importance of establishing a uniform system of meteorological observations throughout India. In this year, the Society asked the Government to constitute a committee on the model of the Meteorological Committee of the Board of Trade in London (Hundred Years of Weather Service, 1976, p.19). In a letter the Society wrote to the Government that the terrific hurricanes causing untold death and destruction had occurred frequently in the past, and would be repeated in future. This prediction which came too true. On October 5, 1864 most of the city of Calcutta, India, was flooded and destroyed by a cyclone (Hundred Years of Weather Service, 1976, p.19). Sixty thousand people were killed at once and many thousands of others died later from the sicknesses and diseases that followed (Gastrell et al, 1865). It also destroyed the port of Calcutta. This storm had roused the attention of the mercantile and shipping community of Calcutta to the necessity of the establishment of a meteorological system for the purpose of warning the port and shipping from these disastrous storms. The mercantile community wrote a letter to the Government about the inefficient storm warning system (Report on the Administration of the Meteorological Department, 1901, p. 12).

A storm-warning system was very essential for an empire whose life-line passed through the sea. The weather-forecasting now became a matter of the most immediate concern for concretize the empire building process. The Military Department also requested to the Government for introducing a systematic weather observing system. Perhaps during this phase meteorological science received the most attention from the colonial Government for its usefulness in commercial, military and medical purposes. The Sanitary Commission also probed into how far climatic and weather conditions were linked with diseases in India and called for a systematic record of the meteorological phenomena (Palit et al, 2007). The Government of Bengal appointed a committee under Blanford to formulate a scheme for the establishment of meteorological observatories on an extend basis along the coast of the Bay of Bengal and at the port of Calcutta. The Government of India also launched a scheme for gathering knowledge about weather of different provinces of British India. Blanford was appointed as a first meteorological reporter of Bengal and within 1868-69, more or less

fifty three weather observation stations were established in throughout Bengal. The activities of all weather observation stations, situated in the peripheries of Bengal, were supervised from Calcutta, the heart of administrative centres of the British India.

The central office of the Provincial Meteorological Reporter of Bengal published daily weather reports, weekly weather reports, monthly weather abstracts, rain-fall reports, annual administrative reports, special reports and storm warnings which gave extra oxygen to the colonial government for preparing their economic, administrative and political policies. However, this system of independent provincial reporters proved unsatisfactory. It generated confusion about methods of observations and there was co-ordination between the provincial offices throughout India. Although, the activities of the provincial reporters made a blue print of the Indian weather and it also helped the colonial government for understanding the economic importance of the meteorological predictions. As a result, colonial Government gave special attention to the establishment of a centralised weather information repository for the empire.

## 5. THE MAKING OF INDIA METEOROLOGICAL DEPARTMENT (1875 – 1905)

IMD was founded in 1875 in Calcutta. It was the most important colonial scientific institution to be devoted solely to Indian meteorology (Report on the Administration, 1976, p.1). The colonial rulers decided to set up the a specialist meteorological institution for supervising and monitoring the weather prediction system throughout India (Laskar et al, 2016). Henry. F. Blanford was appointed as the first Imperial Meteorological Reporter to the British India in 1875. In the beginning, Blanford started as only full-time Gazetted officer of this department. The headquarters of this department was established in Alipur (Calcutta), now it is popular as Alipur Hawya office (আলিপুর হাওয়া অফিস). In the initial period, IMD's activities were directed and its policies largely shaped by Blanford. He emphasised on the plan for infrastructural development of IMD and introduced new schemes for the betterment of this department. After the retirement of Blanford (1875-1889), IMD also organised, developed and structured in colonial period under the leadership of Sir Jhon Eliot (1889-1903), Sir Gilbert Walkar (1904-1924), J. F. Field (1924-1928), Sir C. W. B. Normand (1928-1944) etc. Although, present article particularly discusses the period between 1875 to 1905.

During this period, Sir. Henry F. Blanford and Sir Jhon Eliot prepared and successfully propagated the view of the aims and working methods of the IMD which stimulated to emerge this institution as an important arm of the colonial government. It can be said that during the first twenty eight years of IMD, Blanford and Eliot played most important role for organising and structuring this institution into a thoroughly modernised scientific institution. They prepared a strong guideline for future activities of the IMD. Under their management, IMD was made an important platform for the development of meteorological knowledge about India and South East Asia. Simultaneously, their initiatives also helped to introduce IMD as an important repository of meteorological books, periodicals, collections of weather maps and different meteorological publications of the learned societies throughout the world, which insisted on the development of academic meteorological studies in India and particularly in Calcutta. By analysing their contributions, present chapter shows how Blanford and Eliot performed an important role in the process of constitution and articulation of colonial science.

## 6. CONCLUSION

Present paper is a humble attempt to give an account of the colonial endeavours to introduce and institutionalise meteorological science in Bengal, in particular, and India, in general, during the period 1784 to 1905. The British made some efforts to introduce scientific methods and devices for predicting colonial weather. However these scientific endeavours of the government were instituted with expectation of metropolitan interests. In the nineteenth century, the British objective was to consolidate the empire and the expansion of their commercial interests. Meteorological science was employed as an instrument for this project. The British promotion of meteorological science was expected to supply accurate information for fulfilling their colonial needs. Present article have shown the role of economic factors in shaping the colonial meteorological policies.

## CONFLICT OF INTERESTS

None.

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