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Citation

Jha, M. K. (2013, June 4). *The political economy of the Ganga River : highway of state formation in Mughal India, c.1600-1800*. Retrieved from <https://hdl.handle.net/1887/20931>

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Issue Date: 2013-06-04

Chapter 2

Gangascape: Opening up of the Ganga Plain

[A] history whose passage is almost imperceptible, that of man in his relationship to the environment, a history in which all change is slow, a history of constant repetition, ever-recurring cycles.¹

Introduction

In Chapter 1, we have seen the evolution of an imagined community centred on the Ganga River over the course of several millennia. The fame of the river spread far and wide and the myths of its origin in paradise found currency even in the Greco-Roman world. With the European discovery of the source of the Ganga in the early nineteenth century, the myths about its origin in paradise were debunked. Yet in spite of the scientific mapping of its source, people continued to venerate and worship the Ganga, the practice of which had taken root millennia ago. In the course of history, the Ganga became associated with a rich civilization and material life that emerged and flourished along its banks. This chapter examines the earliest history of the Ganga River and its plain and explores the material life, early settlement, and historical dynamics that underlie state formation along the river. A *longue durée* approach is employed to underline the processes by which humans transformed and appropriated the natural environment of the Ganga plain. South Asian historiography on these historical geographical issues is still in its infancy, though. Therefore, we approach the history of the Ganga plain from an environmental perspective that analyses historical events by connecting them to the ecological specificities of the landscape such as soil, productivity, climate and vegetation.

By taking a historical geographic approach with a focus on environment, the present chapter seeks to understand the interaction between human beings and their natural environment. Human agency is essential for the transformation of geography and natural surroundings into an environment conducive to the growth of civilizations and the movement of history. This fact singularly invalidates the argument about environmental determinism. As Whiting Fox suggests, the nineteenth-century German historian George Wilhelm Friedrich Hegel dismissed such determinism when he remarked: “where geography had produced Greeks, I now see only Turks.”² In the case of the geography of the Ganga plain a similar point may be put forward. Indo-Aryan-

¹ Fernand Braudel, *The Mediterranean and the Mediterranean world in the age of Phillip II*, trans. Siân Reynolds, 2 vols. (Berkeley: University of California Press, 1995), 1:20.

² Edward Whiting Fox, *History in geographic perspective: The other France* (New York: Norton, 1971), 19.

speakers, Shakas (Scythians), Kushanas, Hunas, Turks, Mughals and British in turn dominated the plain in the course of three millennia.

In his work *Geography and history: Bridging the divide*, Alan Baker argues for the mutuality of the disciplines of history and geography to help us comprehend and analyse past events. By way of example, Baker suggests that while practising geohistory (*géohistoire*), the French historian Fernand Braudel was, in fact, able to demonstrate his geographical awareness. For Braudel geohistory implied an intertwining of the disciplines of history and geography by “making historians more geographically aware and geographers more historically sensitive.” In his classic work *The Mediterranean and Mediterranean World in the Age of Philip II*, Braudel sought to gain a historical understanding of the geographical and environmental contexts of human activities. After Braudel set the example by analysing the interactive relationship between human beings and the environment, historians began considering the merit of linking history and geography from a *longue durée* perspective.³ Such an exercise gives depth and nuance to historical explanations. Taking a long term perspective, this study too looks at the Ganga plain through the prism of geography and history.

This chapter is organized into two parts. Section one questions the conventional threefold division of the Ganga plain, i.e. the upper, middle and lower, and its usefulness in explaining historical processes. Instead it studies the plain by paying close attention to the rainfall regime, which helps us to comprehend historical events better. After introducing the Ganga plain, the focus shifts at Gangetic Bihar and it discusses the fertile and productive agricultural zones along the Ganga as well as the comparatively less productive land further south of the riverbanks of the Ganga. After a discussion of geographical problems, section two moves further to situate the historical events on the landscapes of the Ganga plain. Why did certain areas become the lynchpin of state formation? To answer this basic question it demonstrates how the transitional zone (which implies interstitial areas between drier and more humid parts of the Ganga plain) had attracted migrants and resources and how early states were formed. It further discusses the monsoons and climate change and their influence on the historical trajectories of South Asia. In order to take a long term perspective, the section briefly recapitulates the historical developments since the decline of the Harappan civilization. It takes into account the geographical factors, climate change and the interaction between the people of a semi-pastoral nomadic background from the predominantly drier zone and those of a settled, agricultural society of the humid zone. As the pastoral nomads moved along the river banks and drier marches of the plain with their cattle and horses, they interacted increasingly with the people and resources of the humid zones. Once the migrants settled and began exploiting the fertile plain, states began to form. Urban developments began around the mid-first millennium BC

³ Alan R. H. Baker, *Geography and history: Bridging the divide* (Cambridge: Cambridge University Press, 2003), 22; Braudel, *The Mediterranean and the Mediterranean world*, vol. 1.

and it was from these that the continental empires of the Mauryas and Guptas, the first in South Asia, later emerged. State formation and economic growth in the late first millennium and early second millennium AD were stirred by the horse-riding pastoral nomads of the arid zone, the Turko-Afghan groups, who established their political supremacy in South Asia. Their migration appears to have followed the same route through which the Indo-Aryan-speakers reached the Ganga plain. However, the historical processes attending to the migration of the Indo-Aryans and Turks were quite different, as I shall show towards the end of this chapter.

Section I: The Ganga Plain and the Transitional Zone of Bihar

In this section first I will introduce the Ganga plain and its geological evolution. Subsequently I discuss rainfall and other environmental predispositions of the plain and will make a distinction between drier zones of the plain receiving between 25 to about 45 inches annual rainfall and more humid zones receiving more than 45 inches. A simple distinction of the plain on either an east-west or a north-south axis poses problems. The rainfall map of the Ganga plain shows a long parallel region of the drier and more humid zones that follows the Yamuna and Ganga rivers and extends from northwest to southeast and tapers off in Bihar.⁴ The aridity- and humidity-based division corresponds to the agricultural regime, with the predominantly wheat and barley-based economy of the drier parts and the rice-based economy of the humid parts. Along with these two broad environmental divisions, we try to underline the sub-regional or sub-zonal characteristics such as rainfall, soil types, crop patterns and productive capacity in the different parts of the Ganga plain. Gradually I zoom in on the transitional environment zone in Gangetic Bihar which was the nerve-centre of early empires.

The confluence of the Ganga, the Yamuna and the invisible Sarasvati was considered to be the eastern limit of *Aryavarta* or *Madhya Desha* around 900 BC by the Indo-Aryan-speakers.⁵ A few centuries later, as the frontier of the Indo-Aryan settlers moved eastward, the region around the confluences of the Ghaghara, Son, and Gandak with the Ganga in Bihar emerged as a new frontier. This eastern frontier along the river confluences also falls between the relatively dry zone to the south and the humid zone to the north of the Ganga. The transitional area between these two different environment zones played an important role in the state formation process since around

⁴ O. H. K. Spate and A. T. A. Learmonth, *India and Pakistan: A general and regional geography* (London: Methuen, 1967). See the rainfall maps on p. 47.

⁵ For Patanjali, the great Sanskrit scholar of the second century BC, *Aryavarta* was “bounded by Adarsa [probably Kurukshetra] in the west, Kalakavana [probably Allahabad] in the east, Himavanta in the north, and Pariyatra (that is, Vindhya) in the south.” According to *Manusmriti* (first century BC) *Aryavarta* was located between the two seas (in the west and east) and between the Himavanta and the Vindhya. See M. A. Mehendale, “Indo-Aryans, Indo-Iranians, and Indo-Europeans,” in *The Aryan debate*, ed. Thomas R. Trautmann (New Delhi: Oxford University Press, 2005), 48. On chronology of *Manusmriti* or *Manu-Dharmasastras*, see John S. Bowman, ed., *Columbia chronologies of Asian history and culture* (New York: Columbia University Press, 2000), 260.

the middle of the first millennium BC. This study is mostly concerned with this transitional zone of the Ganga plain.

There are many overlapping as well as contrasting geographical features in different parts of the Ganga plain and this complexity demands careful attention. The so-called upper Ganga and middle Ganga plains cannot be taken as homogeneously defined geographic units. Thus, in a way, this is an exercise aimed at moving away from the unsatisfactory macro divisions of the Ganga plain to more local-level divisions. A comprehensive treatment of the Ganga plain's geography is beyond the scope of this study, but my effort stands rewarded at least if the problem inherent with such macro-division of the plain can be admitted. It is hoped that the professional geographers will be able to shed more light on the problem and will show us the local and sub-regional characteristics of the plain in greater detail.

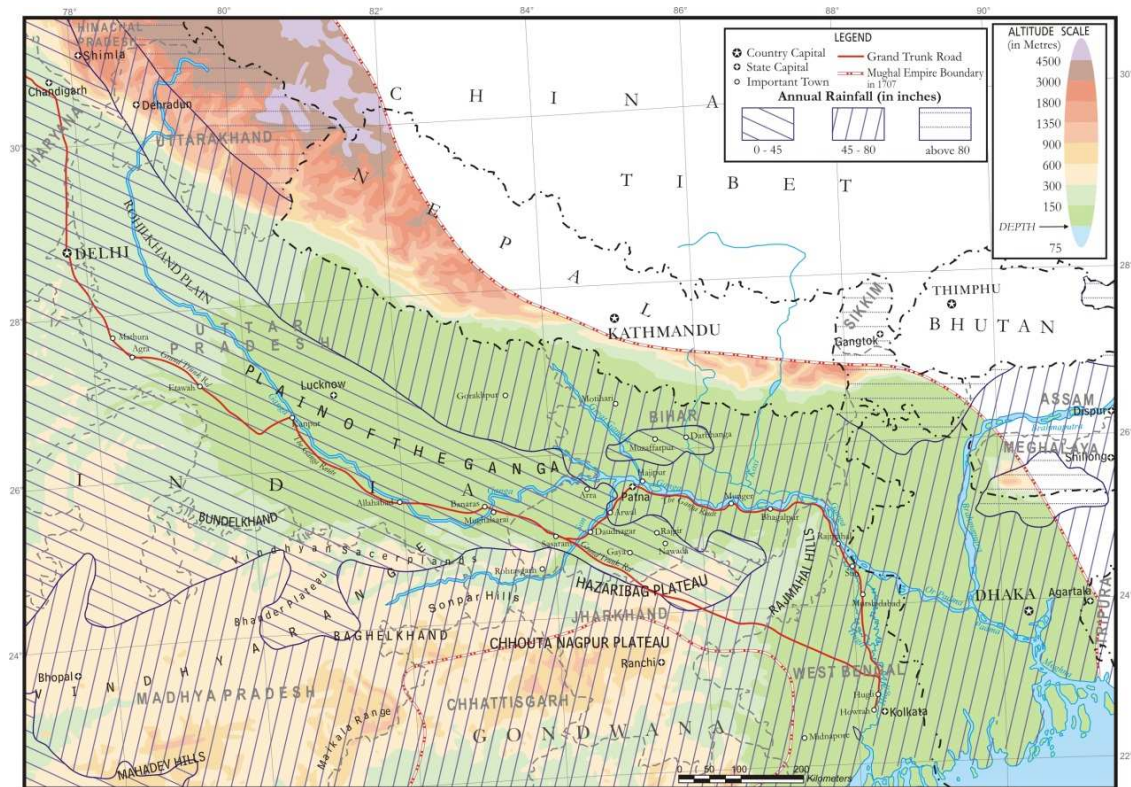
Geological Evolution of the Ganga Plain

During the Pleistocene Period (from 2.5 million to 10,000 BC), geologists believe that a depression existed between the Himalayas in the north and the Chhota Nagpur Plateau and Vindhya Range in the south. In the course of time this deep depression received silt from the Himalayan and Vindhyan rivers and the plain was gradually built up. Towards the end of the Pleistocene Period and during the early Holocene Period (around 8,000 BC) constant silting helped form the Ganga plain.⁶ It is believed that during the tail-end of the late Pleistocene Period (16,000–9,000 BC) there was a climate change leading to extremely dry weather. As a result of drying conditions the rivers issuing from the Vindhya Range assumed a narrower course through their floodplain and they further deepened the old channels.⁷ During the dry weather of the late Pleistocene Period, the Ganga shifted its course through the newly deposited sands of the plain. In the middle stretches of the Ganga plain, in the transitional zone in eastern Uttar Pradesh and Bihar, the river started cutting its bed and receding to the southern fringe of the plain until it almost touched the northern limits of the Vindhya Range and Chhota Nagpur Plateau. In the course of the river's southward shift several meanders of the old bed of the Ganga became ox-bow lakes, traces of which can still be seen in the topography of northern Bihar. The mild climatic conditions of the Holocene Period around 8000 BC brought about transformations in the topography and the marshy land of the waterlogged Ganga plain was gradually transformed into grassland

⁶ V. D. Mishra, *Some aspects of Indian archaeology* (Allahabad: Prabhat Prakashan, 1977), 24. Also Shibani Bose, "Human-plant interactions in the middle Gangetic plains: An archaeobotanical perspective (from the Mesolithic up to c. third century BC)," in *Ancient India: New research*, ed. Upinder Singh and Nayanjot Lahiri (New Delhi: Oxford University Press, 2009), 71–5; Basudev Narayan, *Prehistoric archaeology of Bihar: A survey of Stone-Age industries in environmental context from the Palaeolithic to Neolithic times* (Patna: K. P. Jayaswal Research Institute, 1996), 26–27.

⁷ Govardhan Raj Sharma, et al., *Beginnings of agriculture: From hunting and food gathering to domestication of plants and animals* (Allahabad: Abinash Prakashan, 1980), 4–5.

giving support to vegetation, plant and animal life.⁸ According to geologists and archaeologists, this was how the Ganga plain came into being.



Map 1. The semi-arid and humid zones of Ganga plain.

Problems with Traditional Division of the Ganga Plain

Traditionally, geographers divide the Ganga plain into three parts. However, they find it difficult to give a satisfactory explanation for such a division and often making a virtue of convenience type arguments are resorted to. According to O. H. K. Spate, J. N. L. Baker treats the landmass from the Yamuna to the deltaic margins as the “Indo-Gangetic Plain East,” which appears to be reasonable in physiographical terms, but Baker “takes no account of the big difference between the dry Delhi-Agra country and the wet jute-growing east of Bihar.” Further, despite finding problems with L. D. Stamp’s emphasis on the 40-inch isohyet in the area from the Ganga-Yamuna confluence at Allahabad across to the NNW-SSE section of the Ghaghara, Spate chooses to follow Stamp on the basis of the cropping pattern between “the upper Gangetic Plains” and “Middle Gangetic Plains”; the former region is one of mixed main crops while the latter is one of rice dominating the “acreage at least double that of wheat.” In the end Spate confesses it to be “an unsatisfactory solution.”⁹ R. L. Singh

⁸ Radha Kant Varma, “Pre-agricultural Mesolithic society of the Ganga valley,” in *Old problems and new perspectives in the archaeology of South Asia*, ed. Jonathan Mark Kenoyer (Madison: Department of Anthropology, University of Wisconsin, 1989), 55.

⁹ Spate and Learmonth, *India and Pakistan*, 545–6, 564; L. Dudley Stamp, *Asia: A regional and economic geography* (1929; repr. London: Methuen, 1959), 316–26; see also Birendranath Ganguli, *Trends of agriculture and population in the Ganges Valley* (London: Methuen, 1938), xvii–xviii.

concurs with Spate in criticising Baker's two-fold division of the Indo-Gangetic plain, but he also questions Spate's division of the upper and middle Ganga plains along 40-inch isohyet. Instead, Singh takes the "the eastern limit of the Upper Ganga Plain" to be the 100-metre contour that effectively divides the agricultural regime between the east, where rice is the chief crop, and the west, where wheat, barley and millet predominate. Singh's upper Ganga plain seems to be largely homogeneous, except along its northern and southern fringes. He states that "the region markedly differs in physical, social and economic characteristics from the northern and southern bordering regions but it is devoid of any such limits on the west and the east where the lie of the land with imperceptible physical, climatic and economic variations seldom provide[s] any landmark to put a precise divide between its counterparts, the Punjab Plain on the west and the Middle Ganga Plain on the east." However, for his "Middle Ganga Plain" Singh asserts, "[t]hough it is a region in its own right, it is highly diversified in its different parts which all have their specific geographic settings, problems and resources."¹⁰

According to Birendranath Ganguli, "the Upper Ganga Valley, the Middle Ganga Valley and the Ganges Delta" constitute three distinct rainfall tracts. Further, though the natural boundaries of these rainfall tracts overlap "by imperceptible degrees, yet these regions, as classified on the basis of the variability of the agricultural-economic environment, have, broadly speaking, distinctive characteristics."¹¹ In this study we are more interested in the "distinctive characteristics" of the micro-regions. Although Ganguli is mindful of the artificiality of such division of his agricultural regions, he accepts its utility for the convenience of economic analysis. Perhaps we should further add that the artificial division of the plain needs to be problematized in order to understand the political importance of different regions too.

While demarcating the western boundaries of his "middle Gangetic plains" Spate differs somewhat from Ganguli, who puts Banaras (now Varanasi) as its western limit. According to Spate the middle Ganga plain consists of "what is left between the Upper Gangetic Plains and Bengal: roughly the eastern third of Uttar Pradesh and the northern half of Bihar."¹² Thus, southern Bihar, particularly the plain south of the Ganga River, which is crucial to understand the earliest state formation processes, somehow vanishes from the geographical scheme of Spate's middle Ganga plain. The divisions proposed by geographers appear too artificial and the historical developments do not appear to correlate to them. Apart from the artificiality of such divisions, we should keep in mind many features that serve to make the Ganga plain a unitary region. For example, the Ganga itself makes transportation through the length of plain easy and so links contrasting ecological zones. As a result of such linkages, many of the economic, political and cultural patterns evolved across the entire plain. Furthermore,

¹⁰ R. L. Singh, ed., *India: A regional geography* (Varanasi: National Geographical Society of India, 1971), quotes are from pp. 124, 249.

¹¹ Ganguli, *Trends of agriculture*, xviii.

¹² Spate and Learmonth, *India and Pakistan*, 563–64.

the resources of the drier and more humid zones complemented each other and interactions of the people of these two zones encouraged trade relations. In the present chapter, I will highlight the differentiating as well as unifying components of different regions within the Ganga plain.

The so-called lower Ganga plain which we identify as the deltaic Ganga plain has different characteristics because of the distribution of rainfall and areas of old and new alluvium, and the predominantly rice-based agrarian economy. The Bihar region of the Ganga plain appears to be more of an intermediary/transitional zone between the rice-based economy of the delta and the primarily wheat-based economy of the drier parts of the plain to the west. As we will see in the following paragraphs, the so-called upper Ganga plain too has significant regional characteristics that engendered different forms of economy and polity during the early historical as well as later periods.

Ganga's "Arid Zone"

The weather in the north-western parts of the Ganga plain may be divided into four seasons: the hot summer, the wet summer, the pre-winter transition, and the winter. The climate is sub-humid and more arid than the eastern parts of the Ganga plain. Climatic conditions along the Shiwaliks and Himalayas are different from the rest of the plain. The annual rainfall along the Shiwaliks and the Himalayas reaches around 50 inches while in the western parts of the plain it is only 25 inches. Thus, the tracts along the Shiwaliks and Himalayas share the intensity of rainfall obtained in the humid parts of the Ganga plain.

O. H. K. Spate subdivides the upper stretch of the Ganga plain broadly into the Ganga-Yamuna doab, extending up from the northern approaches to the Malwa passage into the Deccan, Rohilkhand, and the erstwhile Kingdom of Awadh. These subdivisions reflect distinct climatic and cropping patterns. While the doab and the Awadh region lie in the dry zone, receiving between 25 and 40 inches of rain, the northern and north-eastern areas from Saharanpur and Bijnor to Bareilly are more humid (40–50 inches rainfall) where the rice economy is more important.

The prosperity of Rohilkhand depended on the exploitation of the resources of the dry zone to its southwest and the humid zone along the foothills. In the northeast of Rohilkhand, in the higher-rainfall zone of the *Terai* (a belt of marshy grasslands, savannahs and forests), there was considerable jungle cover, generally at the intersection of the Shiwaliks and the Himalayan Range. Meena Bhargava assumes that originally the jungle and marshes of the Terai covered a zone 50–60 miles wide extending from Awadh and to the middle of the Ghaghara River.¹³ Land reclamation for agriculture and settlement began in the eighteenth century with the Rohilla expansion and continued during the early colonial period.¹⁴ In the drier zone to the west

¹³ Meena Bhargava, *State, society and ecology: Gorakhpur in transition 1750–1830* (Delhi: Manohar, 1999), 67–69.

¹⁴ J. F. Richards, *The Mughal empire* (Cambridge: Cambridge University Press, 1995), 191; J. J. L. Gommans, *The rise of the Indo-Afghan empire, c. 1710–1780* (Leiden: Brill, 1995), 145–46; see also

of the Yamuna, there is no Terai as the Shiwaliks stand far away from the Himalayas. Further west, in the Punjab, at the intersection of the Shiwaliks and the Himalayan Ranges, it is too dry for the Terai to develop. In the east, the Terai develops where the Shiwaliks are separated from the snow-mountains by the longitudinal valleys of Nepal. In this region an annual precipitation of more than 50 inches ensures the growth of the Terai.¹⁵

The lithology of the Ganga plain is characterized by *khadar* (newer alluvium) and *bhangar* (older alluvium).¹⁶ The khadar floodplain is formed by the silt, clay, and sand deposited by rivers every year and is very fertile. The bhangar lands occupy the interfluvies above the flood catchment area. The gravels of the Terai area consist of “loosely set sediments, ranging from fine silt or clay particles to coarse sands, pebbles and sometimes even boulders” spread across the slope of the foot of the Shiwaliks.¹⁷ The soil types are largely homogeneous throughout the upper stretches of the Ganga plain. The alluvial soils include *usar* (salt-efflorescence), *domut* (soil mixed with sand and loam), and *bhur* (sandy patches) that cover an extensive area. The tract along the eastern banks of the Ganga in Moradabad and Bijnor Districts is characterized as *bhur* proper. This tract, being located in the rainfall zone of 40 inches, is generally arid at higher elevations and waterlogged in the low-lying areas, especially in wet years.¹⁸

Southwest of this tract, on the western banks of the Ganga, the area between Farrukhabad and Agra falls in a zone that receives 30–40 inches of rainfall annually. Located close to the Ganga, Farrukhabad was one of the most fertile areas. The subsoil was firm and water was close to the surface, which ensured good production of both summer and winter crops. In the lowlands, prone to flooding from the Ganga, the autumn harvest could not be produced.¹⁹ In the zone of comparatively meagre rainfall west of Farrukhabad the water table dips far below the surface of the land, which makes artificial irrigation very expensive and renders this tract largely unfit for cultivation.²⁰ In the early modern and earlier periods these conditions were hardly suitable for agriculture and they played an important role in the way the local economy and polity were organized. While the higher-rainfall zone became the hub of sedentary society,

Sayako Kanda, “Environmental changes, the emergence of a fuel market, and the working conditions of salt makers in Bengal, c. 1780–1845,” *International Review of Social History* 55 (2010): 145, for example, high prices of firewood in northern Indian cities along the Ganga in the early nineteenth century are believed to have resulted from deforestation; see also Henry T. Bernstein, *Steamboats on the Ganges: An exploration in the history of India's modernization through science and technology* (Bombay: Orient Longmans, 1960), 111.

¹⁵ Spate and Learmonth, *India and Pakistan*, 546–50.

¹⁶ The khadar are lowlands formed by the deposition of new detritus of new alluvium in the riverbeds or floodplains. The bhangar are the uplands formed by the deposition of the older alluvium.

¹⁷ Singh, ed., *India: A regional geography*, 130–31.

¹⁸ Spate and Learmonth, *India and Pakistan*, 546–50.

¹⁹ E. T. Atkinson, *Statistical, descriptive and historical account of the North-Western provinces of India*, vol. 7, *Farrukhabad* (Allahabad, 1874–84), 261. Cited in Gommans, *The rise of Indo-Afghan empire*, 132.

²⁰ For the precarious state of late eighteenth- and nineteenth-century agriculture in this region, see C. A. Bayly, *Rulers, townsmen and bazaars: North Indian society in the age of British expansion 1770–1870* (New Delhi: Oxford University Press, 2003), 79.

agricultural production and wealth, the areas receiving less rainfall followed a different political-economic trajectory.

Since agriculture was labour-intensive and water was scarce, people in the dry zone devised alternative survival strategies by taking up economic activities such as animal husbandry, cattle and horse tending, banditry and hiring out themselves as mercenaries.²¹ Furthermore, as the overland and riverine routes also passed through the comparatively drier areas, the porters, *banjaras* (grain traders cum transporters) and boatmen eked out a living by offering transportation services. The people in this zone viewed the agricultural communities of the humid zone to the east as a source of riches, and with their mobile resources they were often successful in raising armies and asserting their authority over their agrarian neighbours.²² Although the settled society produced agricultural resources, it was also dependent upon the mobile wealth and infrastructure of the dry zone. The peasants needed the improved breed of cattle for agriculture and transport and depended on mobile traders such as *banjaras* for the transportation of goods and conversion of agricultural surpluses into money.²³ Thus, rather than being diametrically opposed to each other's interests, societies of the drier and more humid zones existed in complementary opposition to each other. Such dynamics were already at work in the period of Magadhan and Mauryan expansion, when people of the relatively dry zone of south-western Bihar expanded their political domination by incorporating the sedentary society in the more fertile areas to the north of the Ganga. This pattern has been analysed for peasants and nomads in the Arid Zone but it is my contention that it equally applies to this part of the Ganga plain.

Transitional Zone: Bihar

Historical Bihar (including the Indian state of Jharkhand, which was spun off from it in 2000 AD) is situated between latitudes 22°N and 27°31'N, and longitudes 83°20'E and 88°17'E. It became a Mughal *suba* (province) in 1574 and shared its boundaries with the suba of Bengal in the east and Awadh and Allahabad in the west. Its northern parts extended up to the foothills of the Himalayas and in the south it comprised the Chhota Nagpur Plateau, called Khokrah by the Mughals. The boundary of Bihar suba left the

²¹ For an impressive military capacity of Bhadauriya Rajputs in the drier zone of the doab along the Yamuna, in the area to the east and south-east from Agra town, see K. K. Trivedi, "Non-ruling Rajputs families in the Mughal nobility in suba Agra," *Indian History Congress, Proceedings of the Thirty-Ninth Session, 1978* (Aligarh, 1979): 337–344. Trivedi cites Persian Mss. of *Zakhiratu-l Khawanin*, fo. 108 a.

²² J. C. Heesterman, *The inner conflict of tradition: Essays in Indian ritual, kingship, and society* (Chicago: University of Chicago Press, 1985), see chap. 11. For the pastoral occupations in the drier parts of the Ganga plain, see Irfan Habib, "The pastoral sector," in *Economic history of medieval India, 1200–1500*, ed. Irfan Habib (New Delhi: Pearson Education India/Centre for Studies in Civilization, 2011), 59–62. (This is volume 8, part 1, in the series *History of science, philosophy and culture in Indian civilization*, series editor D. P. Chattopadhyaya.)

²³ R. V. Russell, *The tribes and castes of the central provinces of India*, assisted by Rai Bahadur Hira Lal, 4 vols. (London: Macmillan, 1916), 2:162–63; see also Ian J. Kerr, "On the Move: Circulating Labor in Pre-Colonial, Colonial, and Post-Colonial India," in *Coolies, capital and colonialism: Studies in Indian labour history*, ed. Rana P. Behal and Marcel van der Linder, *International Review of Social History*, Supplement 14 (Cambridge: Cambridge University Press, 2006), 91–93

Banaras and Jaunpur area to the west and encompassed the Rajmahal Hills in the east. From north to south, the suba included the relatively flat Terai area with high rainfall and the hilly and forested region with relatively drier conditions to the south.

Flowing in between the two landscapes, the Ganga dissected the whole suba as it flowed from west to east. The north-western parts of the suba included the forested Himalayan foothills and the hilly region known as the Someshwar and Dun Ranges. The western boundary of the modern province of Bihar starts where the Gandak River leaves Nepal and mostly keeps the river to its west, except for a triangle of land between the Gandak and Ghaghara. South of the confluence of the Ghaghara and Ganga, the boundary turns west and southwest toward Buxar reaching up to the Karamnasa River.²⁴ After the Karamnasa, the boundary proceeds further southward and cuts across the Kaimur Range and passes beyond the Son River, west of Patna. After the Son, the boundary extends into the Chhota Nagpur Plateau and runs southeast through hilly, forested country, roughly along the Kanhar River, a tributary of the Son. The eastern boundary includes Bhagalpur and Santhal Pargana within the province and moves parallel to the Rajmahal Hills, which is a forested, and highly fractured region formed by lava rocks.²⁵ As we will see below, the physiography of northern Bihar is flat and well drained by numerous snow-fed rivers whose fertile valleys constituted the heartland of the agrarian economy. Except for a narrow belt along the southern banks of the Ganga, the southern region is mostly hilly and dry; agriculture is precarious and food production could be effected only with labour-intensive artificial irrigation. These contrasting geographical factors in Bihar had important implications for state formation in the course of history, as we will see in the next section.

The Ganga plain in Bihar covers about 28,000 square miles or 42 per cent of the undivided Bihar province.²⁶ The northern plain rises to less than 250 feet above sea level in the western-most parts such as Champaran and northern Saran. Along the Ganga, the plain falls almost imperceptibly to 200 feet in the west and to under 100 feet in the east.

The southern Ganga plain can be broadly divided into two parts, the first being a narrow belt of highlands along the Ganga, and the second the zone more to the south, dotted with hills and plateaus.²⁷ Numerous isolated or long narrow hills such as the Barabar Hills of Gaya or the Kharagpur Hills in Munger punctuate the plain. Rising to

²⁴ The western boundary of Bihar province appears to be arbitrarily drawn. There is hardly any natural geographical barrier between the Banaras and Jaunpur regions on the one hand and the Bhojpur and Sasaram regions on the other. Culturally and linguistically there is much in common among the Bhojpuri-speaking people of eastern Uttar Pradesh and western Bihar. This Bhojpuri-speaking region was historically known as *Purab* (literally “the east”) and its inhabitants were known as *Purabiyas*, or easterners. As D. H. A. Kolff has shown, this region was a leading supplier of labour for the early modern military markets, see *Naukar, Rajput, and sepoy: The ethnohistory of the military labour market in Hindustan, 1450–1850* (Cambridge: Cambridge University Press, 1990).

²⁵ Enayat Ahmad, *Bihar: A physical, economic and regional geography* (Ranchi: Ranchi University, 1965), 1–3.

²⁶ For the historical treatment of the region, the province of Bihar here includes the recently created Jharkhand state, carved out from southern Bihar.

²⁷ Ahmad, *Bihar*, 21–2.

altitudes of 500 feet, these are northern extensions of the Chhota Nagpur Plateau. In the eighteenth century these hills often gave shelter to the chiefs who fought the Mughals who were often at their wits end to contain and chastise them.²⁸ The alluvium found in this region is coarse, more so as one advances southward from the Ganga. The natural means of irrigation such as snow-fed streams, natural lakes, tanks and marshes, so conspicuous in the northern plain, are scarce here.

The productivity of the region north of the Ganga depended on the quality of soil, the formation of which has been dependent largely on the drifting process. This involves soil being brought down from the Himalayan Mountains by rivers and filling in the low-lying depressions or floodplains. The Ganga alluvium is mostly loamy, with variable amounts of sand and clay. Many tracts in the floodplains of the Ganga, Ghaghara, Gandak and Kosi comprise fertile and productive bhangar and khadar soils leached of harmful substances such as saline and alkaline materials, and crops could be grown even without artificial irrigation. Bhangar and khadar are light friable loams with a higher admixture of sand and silt, similar to the leached and non-calcareous alluvia of the Yangtze and Sinkiang (Xinjiang) floodplains of China.²⁹ Since these soils come down from the Himalayas, they are rich in organic mineral contents and, consequently, more productive than the soil types obtained in the southern Bihar plateau region. The plateau soils are called residual soil because they are formed as a result of the decomposition of one kind of rock and are poor in lime, magnesia, phosphorous, nitrogen and potash. Some of these soils are laterite soils, which are red in colour because of the presence of iron oxides. In order to take a closer look at the productive and less-productive tracts of the Ganga plain in Bihar, in the following section I shall discuss the *Gangascapes* to the south and north of the Ganga. For the southern *Gangascape* I will guide the reader by taking detour from Rajmahal in the east to Patna and Shahabad to the west.

South of the Ganga

Rajmahal is positioned at the junction of the transitional zone to the west and the Bengal delta to the east. To the west of Rajmahal and Sahebganj, the Bhagalpur and Munger regions fall along the banks of the Ganga. On the southern bank of the Ganga between Kahalgaon in the east and Munger in the west is a raised belt of limestone

²⁸ Nationaal Archief (hereafter, NA), Accession Number 1.04.02 (hereafter, VOC from *Verenigde Oost-Indische Compagnie*), Inventaris Nummer (hereafter, Inv. Nr.) 8765, From Hugli to Batavia 30.11.1730, "Instructie voor den Manhaften Capitain D: E Jacob Willem van der Brughen," signed by Jacob Sadelijn at Hugli on 23.08.1730, p. 1072. This source reports that one Raja Bakhtawar Singh was harassing the indigenous merchants on the Ganga around the Munger region. The English and the Patna Nawab's force had apprehended him but he later fled into the mountains. In 1729, another Dutch boat journal reports that, "het Raadja Mhamed Asiem [of Kharagpur] door het volk van den Nawab van Pattena uijt zijn rijk na de gebergte Gangelde gejaagd" ("the army of the Nawab of Patna chased away Raja Muhammad Asim to the mountain Gangelde"), see NA, VOC, Inv. Nr. 8760, From Hugli to Batavia 18.12.1728, "Dagregister gehouden door den Capitain Samuel Martinus Hogerwerf, gedurende den optogt naar Pattena in het Jaer 1728," signed by Samuel Martinus Hogerwerf at Hugli on 21.11.1728, see entry of 14.09.1728, pp. 50–51.

²⁹ Ahmad, *Bihar*, 63–4.

roughly two miles broad and more than sixty-two miles long.³⁰ The limestone and hard soil prevented southward erosion of the Ganga and this southern belt witnessed the growth of habitation settlements from early historic times. On this elevated ridge urban centres such as Champa and Munger emerged around the mid-first millennium BC. It is in this region that the mahajanapada of Anga was located. To the south of this limestone belt, the low-lying fertile agricultural area produced rice, opium and other cash crops during the early modern and colonial periods. Fed by numerous hill streams, the Chandan is the principal river of this fertile tract, but it runs only during the rainy season and is barely deep enough for navigation.³¹ Further south, the landscape is dotted with outcrops of the Chhota Nagpur Plateau and rain forest, and the soil hardly supports good agriculture. In the southern Bhagalpur area mineral products such as iron and copper are reported. Silkworm was amongst the forest products of the region, and silk textile production continued to be a significant part of the local economy until the late twentieth century.³² In 1671 the English traveller John Marshall while on his way to Patna around the Rajmahal area, saw an “abundance [*sic*] of fields of Mulberry trees.”³³

The *Gangascape* of the Munger region comprises two river plains dissected by the Kharagpur Hills lying in the north-south direction. During the eighteenth century, Dutch sources mention the chief of “*seckwaards*” (probably refers to the Chakwar of the Bhumihar caste) living in this region.³⁴ On a late-eighteenth-century map the Kharagpur Hills are depicted as covering an area of about twenty square miles with villages and habitation surrounding the hills. The “Gorgot Nullah” is shown skirting the hills from the eastern side and flowing in from south to north for about thirty miles before falling into the Ganga at a place between Jahangeera and Paharpur to the east of Munger. On the map, a road is also shown following the *nullah*, or stream.³⁵ Apart from the Gorgot stream, rivers such as the Kiul and Man drain into the Ganga from the south, the Kiul falling into the Ganga near Surajgarha and the Man between Munger

³⁰ W. W. Hunter, *A statistical account of Bengal*, vol.14, *Districts of Bhagalpur and Santhal parganas* (1877; repr. Delhi: Concept Publishing, 1976), 23.

³¹ C. E. A. W. Oldham, ed., *Journal of Francis Buchanan kept during the survey of the district of Bhagalpur in 1810–1811* (Patna: Superintendent, Government Printing, 1930), 13.

³² Hunter, *Statistical account of Bengal*, 36. Among other hill and forest products of Bhagalpur were game, millet, wax, hides and honey. See Reginald Heber, *Bishop Heber in northern India: Selections from Heber's journal*, ed. M. A. Laird (Cambridge: Cambridge University Press, 1971), 98. Bhagalpur still produces silk textiles of different varieties.

³³ John Marshall, *John Marshall in India: Notes and observations in Bengal, 1668–1672*, ed. Shafaat Ahmad Khan (London: Oxford University Press, 1927), 113.

³⁴ NA, VOC, Inv. Nr. 8762, From Hugli to Batavia 25.01.730, “Journaal in form van een dagregister gehouden door den Luijtenant Commandant Jacob van der Helling,” signed by J. V. D. Helling at Hugli on 10.12.1729, entry of 17.10.1729, p. 73. Around the Surajgarha region near Munger the “*seckwaards*” had built some sort of mud fortress on an island in the Ganga in 1725 but at the time of the journey of Van der Helling it was in ruins.

³⁵ “A Set of General and Particular Maps of Bengal and Bahar with General Maps of Ellahabad and Awd drawn from actual surveys taken between the years 1763 & 1774 by the Honourable East India Company's Surveyors, Constructed from the Original Surveys by James Rennell, Surveyor General,” BL, IOR, X/995, Map no. XVII.

and Bhagalpur. These *nullahs* are scarcely navigable and swell only during the monsoon.

According to a nineteenth-century source the *kewal* soil (fertile loam) along the banks of the Ganga River produced such crops as “rice, tobacco, wheat, barley, rye, poppy, ruhur dal [lentil], murrooa, vetches of all kinds, sugarcane, indigo, Indian corn or maize, junera” and so on.³⁶ The southern parts of Munger were rich in minerals such as nodular iron ores and various types of rocks such as quartz and chlorite. Among the forest products supplied by the region were hard wood, fragrant resins, and lac.³⁷ Animal resources must have been important in the economy as the southern rim of the Ganga had large tracts of pasture.³⁸ But as one ventures further south, the region becomes agriculturally less productive and hills and jungle abound in the landscape, as was noted by an eighteenth-century British surveyor.³⁹

Further west of Munger, the Surajgarha *pargana* (a fiscal sub-division of several villages) lay between the southern banks of the Ganga and the Kharagpur Hills. From a mid-nineteenth century settlement report we know that the region along the banks of the Ganga River was well cultivated. The rich *kewal* soil produced abundant quantities of rice, poppy, indigo, arhar dal and some sugarcane. Toddy and mango fruit provided other sources of income. While the eastern tracts of the *pargana* had thick vegetation, the western parts of the area along the confluence of the Kiul and Ganga were flat and produced such crops as wheat, barley, gram and junera, and agriculture was chiefly concentrated in the fertile tract along the Ganga.⁴⁰ Further south of this fertile area, the landscape is given to hills, jungle and defiles. The red soil found in the region does not support profitable agriculture and people devised alternative sources of livelihood. The Surajgarha area has a notorious reputation in Dutch sources and in the early eighteenth century the Kharagpur raja and the Chakwars maintained a large retinue of militiamen as well as a flotilla of armed boats. The confluence of the Kiul and Ganga Rivers was a difficult point for boats to negotiate during the rainy season, and local chieftains often apprehended the merchants and took “customs duties” from the boats passing through the Ganga.

Between Lakhisarai on the Kiul River in the east and Patna in the west there is an open and low-lying tract subject to annual inundation by the Ganga. This tract to the east of Patna, made up principally of Behar or Bihar District, was highly fertile owing

³⁶ Captain W. S. Sherwill, *General remarks on the District of Monghyr* [with a map] (Calcutta, 1848), 1–2; Comte de Modave, who was passing through Bihar in 1774, noted richly cultivated fields around Munger, see Comte de Modave, *Voyage en Inde du comte de Modave 1773–1776 (nouveaux mémoires sur l'état actuel du Bengale et de L'Indoustan)*, ed. Jean Deloche (Paris: École Française d'Extrême-Orient, 1971), 129.

³⁷ L. S. S. O'Malley, *Bihar and Orissa district gazetteers: Monghyr* (Patna: Superintendent, Government Printing, 1926), 11–12, 14.

³⁸ Dilip K. Chakrabarti, *Archaeological geography of the Ganga plain: The lower and middle Ganga* (New Delhi: Permanent Black, 2001), 163.

³⁹ BL, APAC, IOPP, Mss. Eur. F331/36, Vansittart Collection, Journal of a Survey of the Passes and Western Boundary of Bengal taken by Thomas Carter, 1767, pp. 1–6.

⁴⁰ Sherwill, *General remarks*, 9.

to the rich alluvium and silt deposited by the floodwaters. In this area wheat, rice and poppy were produced in good quantities and artificial irrigation was effected by means of *pynes* (narrow artificial channels), *ahars* (rain or floodwater conserved in earth cisterns) and wells. Hill streams such as the Sukree (Sakri) and Punchaneh (Panchami) were also important sources of irrigation. The surveyor Captain Sherwill remarked that during the rains the Sakri was a formidable stream at the point it entered Behar, but after flowing through the district from south to north it was “a puny and feeble watercourse, in fact, a mere ditch.”⁴¹ Drier conditions prevailed as one moved further south from the Ganga and agriculture required arduous feats of artificial irrigation and water management.

Around Patna, the southern banks of the Ganga formed a high ridge that proved very suitable for the emergence of large towns and urban markets. On this elevated belt bazaars and towns such as Maner, Dinapore, Bankipur, Patna and Fatwa (Fatuha) were conveniently located. As a settlement officer noted, “from Fatwa on to Barh and again from Barh to Mokameh, large bazars [*sic*] and villages succeed one another at short intervals.” On the south side of this elevation there is a low-lying tract, varying from about five or six to twenty-four miles in width and subject to inundation during the rains from the Sakri, Panchami and Punpun rivers coming from Gaya District.⁴² Patna’s southern *Gangascape* included the marshes created by the Punpun River. Although Patna lay on the south side of the river, geographically speaking it had more in common with the plain of northern Bihar than with southern Bihar. As Dilip Chakrabarti suggests, this probably explains why Pataliputra functioned as the frontal projection of the ancient Magadha kingdom to contain the might of the Vajji confederacy to the north of the Ganga.⁴³ Indeed, Pataliputra was located right at the heart of the transitional zone from where the ruling groups deftly exploited the resources of both the dry and humid zones.

Along the southern banks of the Ganga, the westernmost parts of the suba were comprised of Shahabad, which was located in the drier zone. Parts of Shahabad were well watered by rivers such as the Ganga and Son, the banks of which were fertile and well cultivated.⁴⁴ The landscape of Shahabad District presents a diverse terrain with hills and jungles in the southern parts and the Ganga floodplains to the north. Apart from the Son River, a number of minor hill streams passed through the district from the

⁴¹ Captain W. S. Sherwill, *Statistics of the district of Behar* [with a map] (Calcutta, 1845), 1–2. For remarks on the fertility of Behar, see also BL, APAC, IOPP, Mss. Eur. Orme OV 9, Abstract of the Journal...Nov. 29, 1766, fo. 7v; see also BL, APAC, IOPP, Mss. Eur. Orme OV 67, “December 1763 to 25th January 1764: Journal of Captain Maclean’s March from Ukra in Beerboin to the Caramnassa beyond the Town of Sant,” fos. 7–10, for a general idea of the hilly and jungle terrain as well as cultivable strips of land in southern parts.

⁴² H. Coupland, *Final report on the survey and settlement of the government and temporarily settled estates and of certain private estates in the Patna District, 1901 to 1904* (Calcutta: Bengal Secretariat Book Depot, 1907), 1.

⁴³ Chakrabarti, *Archaeological geography*, 176.

⁴⁴ BL, APAC, IOPP, Mss. Eur. F349/2; see the journal written in 1819 by a cotton factor, Richard Kay, who remarks of the well-cultivated tracts above Patna where opium, grain and castor oil grew, entries of 16 and 21 December 1819.

southern hills and joined the Son and the Ganga. As was the case with Munger and Behar, in Shahabad the tracts along the Ganga were highly productive and grew lucrative cash crops such as cotton, sugarcane, and opium, while the southern tracts along the hills were less fertile and given to hilly jungle and mountainous terrain.

While reporting about animal resources and the availability of pasture, Buchanan Hamilton gives an idea of the land use and the general terrain of Shahabad. The largest part of Shahabad, around 780 square miles, consisted of hills, mainly table land which was quite accessible for cattle, and the area contained a great variety of woods. This tract lay in the southern parts of Shahabad through which the Mughal Trunk Route passed.⁴⁵ According to Buchanan the rent for crops along the Ganga was paid exclusively in cash while in areas farther from the riverbanks, crop sharing was commonplace. In the southern parts of Shahabad, agriculture was a more precarious affair, which helps explain why the region was an important source of military labour in the early modern period, as has been demonstrated by Dirk Kolff.⁴⁶ In strategic and political terms, the intersection of hills, rivers and plains made this area subject to independent-minded autonomous chiefs. It was only with difficulty and through constant negotiation that the Mughals were able to keep them under control in the seventeenth century. In the eighteenth century, the situation became fluid precluding effective Mughal control in these outlying areas. With the weakening imperial structure the Rajput zamindars and Bhojpur chiefs began to control the riverine and overland routes passing through the region. The yellow mark on a mid-eighteenth century Dutch map depicting the Bhojpur region is perhaps suggestive of the military and strategic significance of the area.⁴⁷

North of the Ganga

North of the Ganga, the plain was more humid with relatively higher rainfall that supported a more abundant agriculture. Another contrast with the southern region was the existence of numerous navigable channels and the *jheels* (lakes), which were also used for irrigation in the dry season and also for freshwater fish.⁴⁸ In the following paragraphs I shall begin the survey of the northern *Gangascape* with Bhagalpur in the east and end with Saran and Champaran in the west.

In the nineteenth century, Bhagalpur recorded an annual rainfall of 51.2 inches. In the northern parts of Bhagalpur District, in the parganas of Daphar and Khubkhand,

⁴⁵ BL, APAC, IOR, Mss. Eur. D 89, Buchanan Hamilton Ms, "An account of the District of Shahabad," p. 66. For the reference to jungles and tigers in the southern countries along the Son near Rohtasgarh fort, see BL, APAC, IOPP, Mss. Eur. Orme OV 9, Abstract of the Journal...Nov. 29, 1766, fo. 4r. For the state of cultivation and poor quality of soil in the southern tracts, see BL, APAC, IOPP, Mss. Eur. F331/36, Vansittart Collection, "Patna to Rohtas and back, Feb. 7 to Feb. 19, 1772," n.f. Further west to Shahabad, near Ara, there was "a great deal of long grass jungle," see entry of 10. 01. 1772, n.f.

⁴⁶ Kolff, *Naukar, Rajput, and sepoy*, chaps. 2 and 4.

⁴⁷ Nationaal Archief, The Hague, 4VELH 121; see also J. J. L. Gommans, Jeroen Bos and Gijs Kruijtzter, *Grote Atlas van de Verenigde Oost-indische Compagnie*, dl. 6, *Voor-Indië, Perzië, Arabisch Schiereiland* (Voorburg: Atlas Maior, 2010), sheet 408.

⁴⁸ Spate and Learmonth, *India and Pakistan*, 565.

the soil was very fertile and well watered by numerous river channels. In the Daphar pargana the Daus, an offshoot of the Kosi, irrigated and fertilized large tracts of rice land. A hill stream called the Demra also irrigated a considerably big area of the pargana. In the colonial period the land supported two large market towns, Buluah bazaar and Bhirpur, where merchants from Bengal and the north-western provinces had settled down and carried out a large export trade in rice and oilseeds from the Daphar pargana and Nepal. These merchants exploited the river routes for their export trade. The soil of Khubkhand pargana was also well suited for paddy. There were many sunken tracts of land that were ideal for paddy cultivation with little need of artificial irrigation. However, the land along the Tiljuga and Dumra had clayey soils, which needed irrigation before paddy (the *bhadai* rice crop) was sown in April. The irrigation was effected by means of *dhose* or *krine* (a tool made from a hollowed-out tree trunk for lifting water from a *pyne* or canal) before sowing paddy.⁴⁹ To the west of Daphar and Khubkhand was Farkya pargana in the northern part of Munger District, north of the Ganga and opposite Munger town. The pargana had 200 square miles of land, one-third of which consisted of rich alluvial tract along the northern banks of the Ganga. The northern part of the pargana had a large tract of highland dotted with mango groves. Between the south and north, the middle portions of the pargana were subject to inundation from the Bur Gandak, Tiljuga and Kosi.

Bullia pargana was located to the north of the Ganga and further west of Farkya pargana. It was a large pargana with an area of 290 square miles bordered on the north by the Tirhut division and on the east by the Ganga. Flowing from west to east, the Bur Gandak River divided the pargana into two unequal parts. The annual inundation from the Ganga and Bur Gandak was the source of fertility and agricultural wealth. As the survey officer noted of Bullia, it was “a fine rich country, well wooded, cultivated and watered; producing abundant crops of tobacco, wheat, rye, barley, rice, junera, arhur, sugar-cane, indigo and a small quantity of opium; the Pergunnah is well populated, and contains several fine towns.”⁵⁰ More or less similar agricultural conditions and products were obtained in Mulkee pargana, which was divided into two unequal parts by the Ganga. The larger and more important part was located further west of Bullia pargana.⁵¹

To the north of the Ganga, Darbhanga and Muzaffarpur Districts received 49.8 and 45.9 inches of annual rainfall respectively and the region is drained by several Himalayan streams. The Ganga skirted Darbhanga District for about twenty miles in the south. Farther north from the Ganga, especially in the *thanas* (administrative units or police stations) of Rusera and Bahera, several jheels were connected with the hill streams that passed through the Madhubani subdivision and joined the Ganga.

⁴⁹ E. W. Collin, *Survey and settlement of the Srinagar-Banaili estates, 1887–1894* (Calcutta: Secretary, Board of Revenue, 1895), 28.

⁵⁰ Sherwill, *General remarks*, 5.

⁵¹ Sherwill, *General remarks*, 9. In the smaller, southern half of the pargana the Ganga and its sandbank occupied twenty two square mile area.

According to a late-nineteenth-century observation, the lowlands of Rusera and Bahera produced prodigious quantities of winter or *aghani* rice if early floods did not submerge the crop. The area was not suitable for *rabi* crops (sown in winter and harvested in March-April) as several tracts of land remained waterlogged and did not dry until well into the winter months.

Further north of these low-lying tracts, in the Madhubani subdivision, several elevated stretches of land with *balsundari* soil produced both the *aghani* and more valuable *rabi* crops. The areas were flooded by the annual inundation but the water drained off quickly into the low-lying south-eastern parts of Bahera and Rusera thanas. Rivers such as the Bur Gandak, Baya (a tributary of the Great Gandak), Baghmati and Tiljuga provided communication channels that linked the local marts and centres of production. The rivers linked the important marts and the sub-divisional headquarters of Darbhanga, Samastipur and Madhubani. Apart from these towns, Naraya in Phulparas thana was an important mart which handled the local and Nepalese grain traffic. Before the opening of the railways, Rusera was a great mart owing to its location on the Bur Gandak, which gave it access to the Ganga near Munger.⁵²

In Muzaffarpur District, several tracts of land were richly-cultivated, though the topography displays marshland and lakes at various locations. The geography of the district can be divided into three parts: the tract south of the Bur Gandak; the doab between the Bur Gandak and the Baghmati; and the areas north of the Baghmati which touched the borders of Nepal. The first area bordered the Ganga on the south and Darbhanga on the east. The tract is generally elevated upland with, in the southeast, a depression with several lakes, the largest being the Tal Baraila. This area used to be the most fertile and intensively planted. According to the testimony of a mid-nineteenth-century surveyor, Mr Wyatt, there was hardly any room left for the expansion of cultivation.⁵³ The area produced both the *rabi* and *bhadai*—quick-growing rice, millet, maize, jute—crops and the soil got fertilized from the overflow of the Ghaghara and Ganga. Wyatt further reported that two-thirds of the land in Hajipur pargana, on the northern banks of the Ganga, was under cultivation and mango groves, village sites and waste plots covered the rest.

The second geographical area, the doab between the Bur Gandak and Baghmati constituted the lowest part of the district. The old beds of the shifting rivers formed numerous semi-circular oxbow lakes that were sources of irrigation and fishing. The area produced paddy as well as different *rabi* and *bhadai* crops. The third area of the district, to the north of Baghmati, was the relatively low-lying plain, marshy in most places but ringed by ridges of uplands. The types of soil found were “*dorus muttyar*”

⁵² Kerr, *Final report*, 5–9; C. J. Stevenson-Moore, *Final report on the survey and settlement of the Narhan Ward's estate, in the Monghyr District, Bengal, seasons 1893–98* (Calcutta, 1898), 1–3; see also Jean Deloche, *Transport and communications in India: Prior to steam locomotion*, vol. 2, *Water transport* (Delhi: Oxford University Press, 1994), 23.

⁵³ C. J. Stevenson-Moore, *Final report on the survey and settlement operations in the Muzaffarpur District, 1892 to 1899* (Calcutta: Bengal Secretariat Press, 1901), 9. Wyatt is quoted by Stevenson-Moore.

and crops obtained were “bhadoi, kharif, and rabi, and the principle crops [included] paddy, grain, wheat, barley, mussur, soothnee, vegetables, chillies, tobacco, indigo, and poppy.”⁵⁴ Rivers such as the Saligrami Gandak, Bur Gandak and Baghmata and their tributary systems provided communication links to the area.

In the relatively humid zone, the Tirhut region’s prosperity derived from the productive land, the rivers as a source of irrigation and fertile silt and, above all from the well-populated and settled villages as suppliers of labour. This region was a part of the Vajji *ganasangha* (confederacy) during the second half of the first millennium BC. Perhaps the productivity of land and rich resources of the region explains why the ancient Vajji confederacy resisted Magadha’s expansion for a long time. However, the latter’s access to the dry zone resources (militiamen, supplies of iron, and jungle products such as elephants and wood) proved crucial for its political ascendancy over the people of the Ganga plain. Also, in the sixteenth century, the Hajipur fort had become a powerful stronghold of the Afghans who opposed the Mughals’ expansionist drive in the Tirhut region. Further west along the Ganga is Saran District, to the north of which is Champaran District. As noted above, both districts are in an elevated position and slope gradually south-eastward toward the Ganga. While Saran receives 44.9 inches of annual precipitation, Champaran gets 54.1 inches. These areas were highly fertile and richly-cultivated in the early modern and colonial periods. George Forster, who visited the collector’s office at Chhapra in the 1780s, reports that Saran and Champaran together produced annual revenue of fourteen and a half lac rupees, or 145,000 British pounds.⁵⁵ Overall, we can observe that the northern part of the Ganga plain, which was relatively more humid and received higher rainfall, was very fertile and double-cropping was practiced in many tracts. The ease of irrigation through the perennial streams, higher rainfall and fertile soil contrasted with areas south of the Ganga.

In the above section I presented a broad geographical survey of the Ganga plain. In order to situate the historical events in the plain in a long-term perspective, in the following section I will explain the historical trajectories such as migration, settlement and state formation in South Asia by paying close attention to the monsoon and climate change.

Section II: Climate and Migration, 1000 BC–AD 1500

It is hard to find authoritative studies on the migration and settlement pattern of Indo-Aryan-speakers in the Ganga plain during the early historic period. This is primarily because research in geography, history and archaeology has yet to be fully integrated, and the fragmentary treatment of the subject in the historiography gives a rather confusing picture. Theories based on textual interpretation suggest that Indo-Aryan-

⁵⁴ Stevenson-Moore, *Final report.... the Muzaffarpur District*, 10–11; for embankments see also Sir John Houlton, *Bihar the heart of India* (Bombay: Orient Longmans, 1949), 106.

⁵⁵ George Forster, *A journey from Bengal to England, through the northern part of India, Kashmire, Afghanistan, and Persia, and into Russia, by the Caspian Sea*, 2 vols. (London, 1798), 1:26.

speakers migrated to the Ganga plain from the northwest. However, such theories do not elaborate on why these peasants with cattle moved and precisely which route they followed. For example, did they follow the river course of the Yamuna and Ganga or, rather, did they avoid the riverbanks because of the supposedly dense forest?⁵⁶ Also, little light has been shed on why they chose particular regions for settlement in the expansive Ganga plain. Historians explain the Indo-Aryan settlement in the plain in terms of early political formations such as mahajanapadas and ganasanghas.⁵⁷ According to historians, people gradually migrated from the northwest to the southeast in the Ganga plain, but there has been little effort to explain why Indo-Aryans gravitated toward the more humid zones of the eastern Gangetic plain in the first millennium BC. Archaeologists, on the other hand, suggest that people also moved from east to west and sometimes even from south to north in South Asia.⁵⁸ Given the poor state of the archaeological excavations in the Ganga plain, archaeologists are as yet unable to explain whether there was any set pattern in the way people moved.⁵⁹

An alternative approach to this problem is to look at the geographical-logistical (geo-logistical) and environmental influences on migration and settlement. I shall suggest that as herders of cattle and horses with a predominantly pastoral or “mixed economy” based on animal tending and limited food production, the Indo-Aryans

⁵⁶ Rakesh Tewari, “The myths of dense forests and human occupation in the Ganga Plain,” *Man and Environment: Journal of the Indian Society for Prehistoric and Quaternary Studies* 29:2 (2004): 102–5.

⁵⁷ A. L. Basham, *The wonder that was India: A survey of the history and culture of the Indian sub-continent before the coming of the Muslims*, 3rd ed. (London: Sidgwick and Jackson, 1967), 38–43; Romila Thapar, *Early India: From the origins to AD 1300* (Berkeley: University of California Press, 2002), 137–56; Ram Sharan Sharma, *The state and varna formations in Mid-Ganga plains: An ethnoarchaeological view* (New Delhi: Manohar, 1996).

⁵⁸ Dilip K. Chakrabarti, “Prehistoric Ganga basin,” *Journal of the Economic and Social History of the Orient (JESHO)* 15:1/2 (June 1972): 216–17; D. K. Chakrabarti, “Iron age,” in *An encyclopaedia of Indian archaeology*, ed. A. Ghosh, 2 vols. (Delhi: Munshiram Manoharlal, 1989), 1:109. For the problems of Indo-Aryan migration theory, see Sumit Guha, *Environment and ethnicity in India, 1200–1991* (Cambridge: Cambridge University Press, 1999). Guha argues that “when the second urbanisation and agrarian settlement in the great river valleys began to elaborate the outlines of a sub-continental political and cultural system during the first millennium C.E., the nascent centres of that civilization were part of an interacting continuum of communities that occupied, thickly or thinly, the whole of South Asia” (26).

While Guha tries to evade the centrality of the Ganga plain and the Ganga River in state formation and urban developments in the first millennium BC, his argument is of little help in guiding us as to why the process unfolded during that particular period and whether there were some stimuli coming into the fertile Ganga plain which transformed the agrarian economy. However, people might have been migrating in different directions across South Asia for a variety of reasons. But if the ancient Indian textual sources can be relied upon, then the dominant form of migration which actually transformed the political and cultural landscapes of South Asia seems to have come from the northwest. Historian Romila Thapar suggests that some major changes in the societies of the Indo-Ganga plains “resulted from the coming of the Indo-Aryan speakers;” see *Early India*, 134. For the linguistic evidence of the migration of Indo-Aryan-speakers to India, see also Hans Henrich Hock, “Out of India? The linguistic evidence,” in *Aryan and non-Aryan in South Asia: Evidence, interpretation and ideology; Proceedings of the international seminar on Aryan and Non-Aryan in South Asia University of Michigan, Ann Arbor, 25–7 October 1996*, ed. Johannes Bronkhorst and Madhav M. Deshpande (Cambridge: Harvard University, Department of Sanskrit and Indian Studies, 1999), 1–18.

⁵⁹ As noted by Thapar, *Early India*, p. 139, the archaeological sites of the Ganga plain still await horizontal excavation.

probably kept gravitating toward the grasslands where sufficient fodder could be had for their animals. Since the variability of rainfall and water resources largely determined the areas of grassland, fodder and food production in the Ganga plain, therefore I will first give a brief description of the monsoon pattern and rhythms of agriculture.

The Monsoons and Rhythm of Agriculture

In India, fertility, growth and plenitude are closely linked to the seasonal change of wind direction and related phenomenon that affect all lands bordering the northern Indian Ocean and China Seas and which the Arabs called *mausim*, literally season.⁶⁰ In India, the summer monsoon lasts from June to September and the winter monsoon from December to February. The former, known as *varsha ritu* (the rainy season), is the most important for ensuring good harvests as it brings about 90 percent of the country's total annual rainfall. In the Ganga plain the summer monsoon lasts from June until September. During the summer monsoon the plain wears a lush green look as the crops and flora surge into life after the dry hot season comes to an end. The rhythm of agriculture is heavily dependent upon the timely arrival of the *varsha ritu* and has been much celebrated since antiquity. For example, Kalidasa, a fifth-century AD poet, in his *Ritusamhara* attributes lovely verses in praise of the rainy season.⁶¹ The sixth-century *Brhat Samhita* of Varahamihira contains important astronomical observations predicting rainfall.⁶² Issues relating to agriculture and forecasting rain by observing nature and wind patterns were carried over into an eleventh-century eastern Indian text called the *Krsiparasara* (Extension of agriculture), the author of which is believed to have partly relied on the *Brhat Samhita*.⁶³ The rainfall and monsoon entered these texts primarily because of their overwhelming importance for agriculture and material wellbeing of society.

The rhythm of agriculture neatly follows the monsoon. The double-crop pattern of India, that is *rabi*, and *kharif* (a crop sown in late summer and autumn and harvested in winter), is organized along the two monsoons.⁶⁴ The winter or *rabi* crops—wheat,

⁶⁰ Henry Yule and A. C. Burnell, *Hobson-Jobson: A glossary of colloquial Anglo-Indian words and phrases, and of kindred terms, etymological, historical, geographical and discursive*, ed. William Crooke (London: John Murray, 1903), 577.

⁶¹ R. S. Pandit, *Ritusamhara, or The pageant of the seasons: Translated from the original Sanskrit lyrics of Kalidasa* (Bombay: National Information & Publications, 1947), 35–36. For the life and historicity of Kalidasa, see P. von Bohlen and Herman Kreyenborg, *Kalidasa: Der kreis der jahreszeiten (Rtusamhāra)* (Leipzig: Insel-Verlag, 1919), 36–38. It is believed that the poet was born in a north Indian city of Ujjain in the early fifth century AD.

⁶² Varahamihira, *Varahamihira's Brhat Samhita with English translation, exhaustive notes and literary comments*, by M. Ramakrishna Bhat, 2 vols. (Delhi: Motilal Banarsidass, 1981), chapters 19–28.

⁶³ Ryosuke Furui, "The rural world of an agricultural text: A study on the *Kṛṣipāraśara*," *Studies in History* 21:2, n.s. (2005): 154–55; Also see *Kṛṣi-paraśara*, ed. and trans. Girija Prasanna Majumdar and Sures Chandra Banerji (Calcutta: Asiatic Society, 1960).

⁶⁴ The origin of the *rabi* and *kharif* crops in South Asia is believed to go back to the sixth and early second millennium BC respectively. The former is associated with wheat and barley cultivation and the latter with sorghum, various millets and rice. See Richard H. Meadow, "Continuity and change in the

barley, oilseeds, and various types of lentils—need less water than the kharif crops and are sown after the rainy season is over. In the humid areas of the Ganga plain the rabi crops benefit from the irrigation carried out from the rivers and stagnant pools of water while in the drier zones of the plain and in the Punjab the crops depend on the precipitation during the winter monsoon.

The summer or kharif crops may be divided into two types: bhadaï and aghani—predominantly high-quality rice. These summer crops chiefly rely on the downpour during the summer monsoon. The sowing of bhadaï crops commences with the onset of rains in June/July and harvesting is done in August/September. The aghani paddy crop is sown in August/September and relies chiefly on the monsoon rainfall and in the later months on the availability of water through artificial irrigation. Harvesting of the crops is done in November/December. After the bhadaï crop is reaped the peasants sow lucrative rabi crops in the same field. Further, the bhadaï-rabi combination offers more security against the failure of the rains. In the case of aghani rice, the crop takes longer to mature and only inferior rabi crops can be cultivated in the same ground.⁶⁵

The rabi crops sown in the more arid zone differ from those cultivated in semi-arid areas. For example, in the areas west of Allahabad valuable crops such as wheat, barley, and oilseeds are produced while in Bihar the inferior cash crops such as *khesari* (chickling-vetch) and gram are sown on the fields cleared after aghani paddy is harvested.⁶⁶ The rabi crops in the more humid parts of the Ganga plain are less dependent on winter precipitation as the summer monsoon recharges the water table and numerous tanks and pools retain sufficient water for irrigation. Thus, the monsoon rainfall and the constant water supply from the snow-fed rivers, ponds and tanks ensure fertility of the more humid parts of the Ganga plain and as a result it became one of the most densely populated areas in the world.

The French geographer Paul Vidal de la Blache (1845–1918) correctly assumed ancient centres of dense population to have been “confined approximately to a zone bounded by the Tropic of Cancer and the fortieth parallel of latitude.”⁶⁷ Humid and wet parts of the Ganga plain squarely fit the example of zones that historically maintained a high population density and it was in this area that ancient civilizations flourished. The whole Ganga plain is characterized by dry winters and wet summers. As we already noted the plain is in no way homogeneous and the crop patterns, methods of agriculture and productivity show contrasts from one area to the other depending upon the variability of rainfall. The summer monsoon gradually diminishes as it moves northwest from the Bay of Bengal toward the Indus plain. From east to west, the monsoon gives more rain in the northern sub-montane tract of the Ganga plain than in

agriculture of the greater Indus valley: The paleoethnobotanical and zooarchaeological evidence,” in *Old problems*, ed. Kenoyer, 61.

⁶⁵ O. H. K. Spate et al., *India, Pakistan and Ceylon: The regions*, 566–68.

⁶⁶ Spate and Learmonth, *India and Pakistan*, 566–68; J. J. L. Gommans, *Mughal warfare: Indian frontiers and high roads to empire, 1500–1700* (London: Routledge, 2002), 8–9.

⁶⁷ Vidal de la Blache, quoted in Ganguli, *Trends of agriculture*, xvii.

the southern tracts of the Vindhya Range and western parts of the Chhota Nagpur Plateau, and in the course of its westward movement it gradually weakens in intensity.⁶⁸

The relatively dry conditions to the south of the Ganga had significant implications for state formation in ancient India. Human settlement, urban developments and state formation were firmly rooted in this strategic region, and Pataliputra remained the imperial centre for many centuries. Why should Pataliputra have become a favoured seat of imperial power since the late first millennium BC? Does climate change hold the clue?

Climate Change

While the analysis makes use of climatic and geographical data to make for the deficiencies of textual and archaeological sources, I do not intend to write a geography- or climate-determined history of the settlement pattern in the Ganga plain. Apart from the natural environmental factors, the migrants themselves played an active role in adopting new technologies, experimenting with the agrarian economy and interacting culturally with an already-settled population in the Ganga plain. At the same time it will be hard to ignore the natural environmental factors as too benign or insignificant to warrant any historical attention. At best our exercise is aimed at striking a balance between the two to offer a broad-based historical interpretation.

Recent data on climate change, though far from conclusive, broadly correlate with wider historical developments in South Asia. It is assumed that around 16000 BC, at the height of the last glacial peak, the summer monsoon was much weaker and summer rainfall far less than what it is in contemporary South Asia. This meant unfavourable conditions for agricultural development in the drier parts. Around 9000 to 8000 BC summer precipitation peaked, and then followed a gradual trend of drying. The period from around 8000 to 1000 BC has been divided into four climatic phases. Phase one (before 8000 BC) marks a watershed which ended with an increase in rainfall compared to the pre-9000 BC; phase two (8000–7500 BC) remained a wet period with relatively less rainfall than the earlier period; and phase three (7500–3000 BC) saw a weakening of rainfall and an increase in aridity compared to the previous phases, although it was not too dry to effect any ecological dislocation. Phase four (3000–1000 BC) has been divided into three sub-phases. Sub-phase one (3000–1800 BC) is believed to have witnessed a dramatic increase in rainfall which might have been slightly higher than the present day; sub-phase two (1800–1500 BC) was a short spell with decreased rainfall; and sub-phase three (1500–1000 BC) had a slight increase in rainfall although arid conditions continued.⁶⁹ There were short-term climatic

⁶⁸ Ganguli, *Trends of agriculture*, xvii–xviii; see also Spate and Learmonth, *India and Pakistan*, 54–63. See particularly the map on p.55 for the rainfall zones.

⁶⁹ Jim G. Shaffer and Diane A. Lichtenstein, “Ethnicity and change in the Indus valley cultural tradition,” in *Old problems*, ed. Kenoyer, 120. See also V. N. Misra, “Climate, a factor in the rise and fall of the Indus civilization: Evidence from Rajasthan and beyond,” in *India’s environmental history: From*

fluctuations and changes in local precipitation across this whole period, and while historians disagree about certain specifics, certain broad trends have been identified.⁷⁰

If the climatic data summarized by the historians Herman Kulke and Dietmar Rothermund are correct, it is interesting to note the patterns of climate change and historical shifts in South Asia over the past millennia. They have identified trends that suggest that the climate of the last two millennia, up to the present, follows a pattern similar to a mean value between the extremes found in the period between 2500 and 400 BC. It is believed that in the third millennium BC there was a sudden rise in the rainfall which reached its peak by 2500 BC but, by the end of that millennium the precipitation receded as quickly as it had risen and, from around 1800 to 1500 BC rainfall was far less than the 3000 BC level. Between 1500 and 1000 BC there was another slight increase in rainfall before it receded again. Around 500 BC the rainfall increased, but the century around 400 BC was perhaps the driest period on record. In the following centuries the rainfall became more abundant but never reached the level of 2500 BC.⁷¹

In the first and second millennia AD two major climatic phases are identified which have had important economic and political repercussions throughout Eurasia. The Medieval Warm Period 800/850 or 900/950 to 1250/1300 AD (also known as the Medieval Climatic Anomaly) has been identified primarily on the basis of European data and corresponds to demographic and economic growth in the European high Middle Ages.⁷² According to Victor Lieberman, at the same time monsoon Asia is believed to have witnessed high precipitation and a corresponding increase in agricultural activity. Sceptics suggest paying attention to the local variations in climatic patterns that might not follow the Medieval Warm Period climatic trends. In the case of Central Asia, for example, Richard Bulliet notes a lack of demographic and economic growth between the eleventh and twelfth centuries when an intense cold wave and snowfall marked the winter months and famines were frequent.⁷³ The efforts of the steppe-dwelling Central Asian populations to venture toward more moderate climate zones was perhaps the result of complex circumstances involving a colder climate, difficult agricultural and cattle-herding conditions and a harsh economic life. The Turko-Afghan raids in the eleventh and twelfth centuries and their eventual success in

ancient times to the Colonial Period, ed. Mahesh Rangarajan and K. Sivaramakrishnan, (Ranikhet: Permanent Black, 2012), 53–64.

⁷⁰ Meadow, “Continuity and Change,” in *Old problems*, ed. Kenoyer, 61–62.

⁷¹ Hermann Kulke and Dietmar Rothermund, *A history of India* (New York: Routledge, 2004), 30.

⁷² Victor Lieberman, *Strange parallels: Southeast Asia in global context, c. 800–1830*, vol. 2: *Mainland mirrors: Europe, Japan, China, South Asia, and the islands* (Cambridge: Cambridge University Press, 2009), 80; Victor Lieberman and Brendan Buckley, “The impact of climate on Southeast Asia, circa 950–1820: New findings,” *MAS* 46:5 (2012): 1050, see for Medieval Climatic Anomaly beginning in 900/950 AD; Richard Bulliet, in his study on Iran, suggests that there occurred a “prolonged climatic cooling” from the first half of the ninth century to the early twelfth century in a geographical area encompassing Iran, Central Asia and Mesopotamia as far south as Baghdad, Anatolia and Russia. See Richard W. Bulliet, *Cotton, climate, and camels in early Islamic Iran: A moment in world history* (New York: Columbia University Press, 2009), chap. 2.

⁷³ Bulliet, *Cotton, climate, and camels*, 69–95.

establishing the Delhi Sultanate may perhaps be viewed from the perspective of diminishing economic and political opportunities in Central Asia as a result of adverse climatic conditions.

Lieberman argues that the so-called Little Ice Age from 1580 to 1680 contributed to a series of political crises, failed monsoons and famine in different parts of Europe and Asia. In Europe, the periods between 1470 and 1560 and again between 1710/1720 and 1805 witnessed a partial reversal of the cooling trend, which meant agriculturally more propitious conditions in both Europe and Asia. It has been rightly suggested that such hemisphere-encompassing climatic phenomena varied with altitude, latitude, and the geomorphology of a given area, and significant differences can be noted in the rate of climate change from one region to another. At the same time, long-term climatic trends in a given region could coexist with annual and decadal fluctuations.⁷⁴

Despite these problems and the fragmentary nature of climatic data generally, if we correlate the broad historical trends since the Harappan civilization with the climatic and rainfall trends noted above, it is tempting to see a correspondence between them and the cycles of historical patterns in South Asia. A relatively higher precipitation in the third millennium BC witnessed the full-blown Harappan urban civilization while the growing aridity at the end of the third millennium BC coincided with the Harappan decline. The influx of Indo-Aryan-speakers into the Indo-Ganga plain corresponds with the largely arid but slightly increased rainfall between 1500 and 1000 BC. The available climatic data also agree with the migration of the Indo-Aryans from the Indo-Ganga divide to the south and eastward into the Ganga plain as the weather became drier again after around 1000 BC. Improved rainfall around 500 BC would have further accelerated agrarian expansion and state formation in the areas straddling the dry and humid zones of the Ganga plain.

The recent study of Sanai Lake in the Ganga plain seems to confirm the above hypothesis on climate change based on the palaeobotanical findings in Rajasthan. The researchers of Sanai Lake concluded that “[t]he climatic oscillation recorded from the Sanai lake match broadly with the climatic records from other parts of the Indian subcontinent, suggesting that these oscillations are an expression of broad scale probably global climatic changes rather than local climatic variations.”⁷⁵ Whether global or local, if the climatic data discussed in the above paragraphs are correct, it is easy to correlate them with the historical processes in South Asia. Eurasia—and particularly South Asia—underwent significant economic and political change during

⁷⁴ Victor Lieberman, *Strange parallels: Southeast Asia in global context, c. 800–1830*, vol. 1: *Integration on the mainland* (Cambridge: Cambridge University Press, 2003), 102. In a recent article, the earlier understanding of a “markedly unfavorable climate in the mid and late seventeenth century” as espoused by Lieberman and Anthony Reid, has been revised in the light of new climate data from mainland Southeast Asia, see Lieberman and Buckley, “The Impact of Climate,” 1088–89.

⁷⁵ S. Sharma, et al., “Late-glacial and Holocene environmental changes in Ganga plain, Northern India,” *Quaternary Science Reviews* 23 (2004): 145–59; see also Purushottam Singh, *Archaeology of the Ganga plain*, 33.

the period between the tenth and thirteenth centuries AD. Partly as a result of an improved monsoon after the end of the first millennium AD, the arid zones of South Asia (receiving about 45 inches or less rainfall per annum) were increasingly brought under the plough, leading to increased agricultural production, on lines roughly comparable to what happened in Pagan in Burma during this period.⁷⁶ Another development in the Eurasian context was perhaps a remarkable population growth. André Wink suggests that between the seventh and early eleventh centuries the population in some parts of Central Asia might have doubled.⁷⁷

Demographic growth would have been more pronounced especially during the mild climatic phase between the seventh and tenth centuries. It was during this period that Iran witnessed rapid economic growth and expansion of cotton cultivation thanks to a warmer climate. Subsequently, in the eleventh and twelfth centuries, Central Asia suffered agricultural and economic reverses primarily as a result of climatic cooling as noted by Bulliet. During the period of reverses, there occurred a series of plundering raids in India beginning with Mahmud of Ghazni around the turn of the eleventh century. A part of the semi-nomadic population of the Eurasian steppe was lured into the raiding expeditions on the agriculturally rich and resourceful Indo-Ganga plain. The horse-based armies of Inner Asia (including modern Afghanistan, southern Iran, Turkmenistan, and Kazakhstan) were able to establish their political dominion over the Indo-Ganga plain by the thirteenth century. The favourable monsoons during the early centuries of the second millennium AD would have assisted agrarian expansion and economic growth in South Asia. Impetus to economic growth also came after the establishment of the Turkish Sultanate when long-distance trade linked the entire Ganga plain closely with the wider Eurasian economy. This trade network incorporated large parts of Asia and as far west as the eastern Mediterranean.⁷⁸ As the Ganga plain lies in the “exposed zone,” to use Lieberman’s term for parts of Eurasia within easy reach of semi-nomadic conquerors from Central Asia, the connection between climate change and such gradual migrations from the northwest of the Indian subcontinent can be traced at least to the end of the third millennium BC, when the western migratory routes from Central Asia to the Indus plain had become active again as we will see shortly.⁷⁹ To analyse the possible effect of climate change on the pattern of migration

⁷⁶ Lieberman, *Strange parallels*, 1:88–119. It is suggested that in the arid zones a strong monsoon would have influenced agricultural activities by providing rain water and by making the construction of dams on the rain-fed streams worthwhile. For example, between AD 1000 and 1300, in the Deccan’s dry Telangana region around 5,000 such water reservoirs were constructed; see Lieberman, *Strange parallels*, 2:690; M. K. Dhavalikar, on the basis of Nile flood data, suggests that between AD 600 and 1000 droughts and famines were probably frequent in India, “Green imperialism: Monsoon in antiquity and human response,” *Man and Environment: Journal of the Indian Society for Prehistoric and Quaternary Studies* 26:2 (Jul–Dec 2001): 25–6.

⁷⁷ André Wink, *Al-Hind: The making of the Indo-Islamic world*. Vol. 2, *The slave kings and the Islamic conquest, 11th–13th centuries* (New Delhi: Oxford University Press, 2001), 168.

⁷⁸ Janet L. Abu-Lughod, *Before European hegemony: The world system AD 1250–1350* (New York: Oxford University Press, 1989), 170–84.

⁷⁹ For the exposed zone, see Lieberman, *Strange parallels*, 2:92–114.

and settlement in the Ganga plain, I shall briefly recapitulate the dislocation of the population as a result of the Harappan decline.

The migration of the Harappans indicates serious trouble in the sustainability of the lower Indus region as a habitat zone. These would have resulted from increasing aridity around 2000 BC. Other climatic factors such as a shift in the river course as a result of seismic activity cannot be ruled out. Robert Raikes suggests that after the diversion of the Ghagghar and consequent decline of Kalibangan around 1800 BC, the inhabitants moved upstream to the Ganga river system.⁸⁰ Such upstream movements perhaps reflect the distress resulting from the scarcity of water resources. For the abandonment of Kalibangan, Raikes argues that the theory of “sudden and dramatic” climate change must be discounted. The archaeologist D. P. Agrawal, on the other hand, holds climate change to be a probable factor in the Harappan decline and believes that increasing desiccation would have given a final blow to a people already exhausted from their efforts to control the menace of floods.⁸¹ Scholars of environmental history have shown that during the third and early second millennium BC there was an erratic pattern of global climate and rainfall. Gurdip Singh’s research based on pollen identification from twenty-two old lake sediments in Rajasthan shows that between 3000 and 1800 BC there was substantially higher rainfall and the decline of the Harappan civilization coincided with the rise in aridity toward the end of that period.⁸²

Historians such as Shereen Ratnagar have raised several objections to this proposition about the rise in aridity for the general decline of the Harappan civilization. It has been suggested that the impact of such dry weather would be different in Sind, receiving less than two inches of annual rainfall and, at Ropar in the Punjab, which receives five to six inches.⁸³ Indeed, the different rainfall zones of Sind and Ropar would have been affected differently by climate-related change, and the decline of the latter was probably linked more to the end of its entrepôt function than to its aridity. As B. D. Chattopadhyaya suggests, Ropar was a nodal point facilitating the linkages between the pastoral and agricultural modes of economy, and it is possible that the decline of the lower Indus towns would have adversely affected the fortunes of Ropar as a supply centre for the goods of the pastoral economy.⁸⁴ Furthermore, since eastern

⁸⁰ Robert Raikes, “Kalibangan: Death from natural causes,” in *The decline and fall of the Indus civilization*, ed. Nayanjot Lahiri (New Delhi: Permanent Black, 2002), 210.

⁸¹ D. P. Agrawal, *The Indus civilization: An interdisciplinary perspective* (New Delhi: Aryan Books, 2007), 9. For flooding as a cause of the decline of Harappan civilization, see George F. Dales, “Civilization and floods in the Indus Valley,” *Expedition* 7:4 (1965):10–19. Experience from the Indian subcontinent shows that famines or dry seasons were generally accompanied by excessive rains and flooding, and the vice versa. If the unprecedented flooding of the Indus in Pakistan in 2010 and again in 2011 is any guide, we can assume that such extreme weather conditions would have contributed to the decline of the Harappan civilization.

⁸² Gurdip Singh, “The Indus valley culture (seen in the context of post-glacial climate and ecological studies in North-west India),” *Archaeology and Physical Anthropology in Oceania* 6:2 (1977): 177–89.

⁸³ Shereen Ratnagar, *The end of the great Harappan tradition* (New Delhi: Manohar, 2000), 16.

⁸⁴ Brajadulal Chattopadhyaya, *Studying early India: Archaeology, texts, and historical issues* (New Delhi: Permanent Black, 2003), 52. For a survey of the Harappan landscape and environment, see Jane McIntosh, *The ancient Indus Valley: New perspective* (Santa Barbara: ABC-CLIO, 2008), 9–26.

Punjab received higher rainfall than Sind, in a drier climatic condition the migration would tend to be more toward the higher rainfall zone and to the upper reaches of the Himalayan glacier-fed perennial rivers of the Indo-Ganga plain after the early second millennium BC.

Migration and Settlement

It is quite possible that climatic disturbances forced the people to migrate and settle in the areas that offered greater security in terms of the possibilities of river irrigation and comparatively higher rainfall. Many late-Harappan sites overlap with the Painted Gray Ware⁸⁵ culture sites at Bhagwanpura and Dadheri in Haryana and Katpalon and Nagar in Punjab⁸⁶ in the relatively higher-rainfall zone. The late-Harappan sites also coincide with the Ochre Colour Pottery⁸⁷ levels at the sites of Bargaon and Ambakheri in western Uttar Pradesh. Thus, we may discern a pull toward the Indo-Ganga plain where the late-Harappans and new migrants from Central Asia settled in the second millennium BC. Insufficient climatic data from Central Asia do not permit us to suggest whether it was a drier and colder climatic regime around 2000 BC that pushed the Central Asian steppe dwellers to seek better pasture lands for their livestock.⁸⁸ That a gradual, protracted migration took place is beyond doubt as is evidenced from the archaeological and linguistic works. The north-western route of the Indian subcontinent facilitated migration of horse-riding pastoral nomads who moved into the more fertile and agriculturally stable regions of the upper Indus plain in the Punjab.⁸⁹ Following some of the early Indo-Aryan-speakers, it is believed that the Sanskrit-speaking Rig Vedic Aryans started migrating to South Asia from about 1400 BC, and they made the *Saptsindhu* (the land of seven rivers) region of the Punjab their new home.⁹⁰

⁸⁵ This was wheel-turned, well-fired gray pottery. It bore many imaginative designs of various shapes. It is supposed to belong to the later Vedic period but is generally not related to the Indo-Aryans. Recently, this pottery culture has come to be dated between 1100 and 500 BC. It is suggested that it would have been produced by local people who were low in the Indo-Aryan social hierarchy.

⁸⁶ R. S. Sharma, "Problems of continuity and interaction in Indus and post-Indus cultures," *Social Scientist* 28:1/2 (2000): 5–6.

⁸⁷ This pottery type is found at the lowest levels of the major sites containing materials dating pre-900 BC, and therefore is assumed to belong to the early Rig-Vedic Aryans.

⁸⁸ Andre Gunder Frank, *The centrality of Central Asia* (Amsterdam: VU University Press, 1992), 9.

⁸⁹ See Shereen Ratnagar, *Understanding Harappa: Civilization in the greater Indus valley* (New Delhi: Tulika, 2001), 134–5, for the opening of the Central Asian migration route around 2000 BC. For horse domestication, see Sandor Bökönyi, "The Earliest Waves of Domestic Horses in East Europe," *Journal of Indo-European Studies* 6:1–2 (1978): 17–64. Evidence of sporadic horse domestication appears in southern Ukraine from the fifth millennium BC. The practice became widespread throughout East Europe only by the end of the third millennium BC. A parallel move toward horse domestication seems to have occurred in Kazakhstan and Central Asia at the turn of the fourth millennium BC. In the course of the third millennium, the use of horses became more widespread across Central Asia. It is in this context that the migration of horse-mounted pastoralists to the Indian subcontinent at the end of the third millennium BC should be seen. Horse domestication is also discussed in Richard W. Bulliet, *Hunters, herders, and hamburgers: The past and future of human-animal relationships* (New York: Columbia University Press, 2005), chaps. 5–7.

⁹⁰ Burjor Avari, *India: The ancient past: A history of the Indian sub-continent from c.7000 BC to AD 1200* (London: Routledge, 2007), 66.

One can form an idea about the Rig Vedic Aryans' geographical knowledge from their naming of the rivers located in their habitation zone. The western rim of their region was bound by rivers such as the Indus, Gomāl, Kurram and Kubha. To the north they mention the Swat River, the valley of which was inhabited by the migrating Indo-Aryans. The core region of the Rig Vedic Aryans' geographical horizon was the drier but well-watered zones in the Punjab. Apart from the Indus, the seven rivers of the *Saptsindhu* region were the Sarasvati, Drishadvati, Sutlej, Beas, Ravi, Chenab and Jhelum. The eastern boundary of this zone was marked by the Yamuna and the Ganga; the last river is mentioned only once in one of the latest hymns of the *Rig Veda*. It was in this habitation zone where the early generations of Indo-Aryans had settled and led pastoral and semi-nomadic lives while growing some barley and other cereals.⁹¹ By around 900 BC, however, the Indo-Aryans had entrenched themselves in the Ganga-Yamuna doab.

Ancient Indian texts speak of five geographic components of the Indian subcontinent: *Madhya Desha* or middle country; *Uttarapatha* or northern India; *Prachya* or eastern India; *Dakshinapatha* or southern India; and *Aparanta* or western India. The centre of gravity of this fivefold division was firmly rooted in *Madhya Desha*, also known as Aryavarta or the home of the early Aryans, and its symbolic boundary extended from the west in the dry zone of Haryana where the Sarasvati River is lost into sand and reached the east in the relatively less arid area at a place where the Sarasvati is believed to resurface and join the confluence of the Ganga and Yamuna. The Sanskrit word *patha* refers to a road, hence *Uttarapatha* and *Dakshinapatha* signified the northern and southern roads. Both these long-distance arteries of India remained crucial for migration and movement till the nineteenth century when the railroads were laid down mostly parallel to the tracks of these ancient roads. While *Uttarapatha* linked the Ganga and Yamuna river systems and the Punjab to Central and West Asia, *Dakshinapatha* or the southern road connected *Madhya Desha*, Malwa and the Deccan Plateau. Interestingly, both these highroads pass along the eastern and southern extensions of the semi-arid zone.⁹² Does such alignment of roads along the margins of the semi-arid zone offer any hint about the migration of Indo-Aryans to the Ganga plain?

The precise migratory routes followed by the Indo-Aryans to reach the Ganga plain are still shrouded in mystery. Historians are vague about whether they followed the Himalayan foothills or simply kept to the riverbanks of the Yamuna and Ganga to reach the agriculturally more fertile semi-arid zone of the Ganga plain. Archaeological data and textual sources have been of little help in solving this riddle. Far from claiming to solve this problem, we suggest that the Indo-Aryans moved through the drier, more accessible zones where the requirements of their mixed economy (cattle

⁹¹ Bridget Allchin and Frank Raymond Allchin, *The rise of civilization in India and Pakistan* (Cambridge: Cambridge University Press, 1982), 306.

⁹² Gommans, *Mughal warfare*, 17; for the geographical details, see Joseph E. Schwartzberg, ed., *A historical atlas of South Asia* (New York: Oxford University Press, 1992), 161– 63.

tending and growing a little wheat and barley) could be met. They found well-drained arable, meadow-type older alluvium and prairie soils, drainage and pasture along the banks of the Yamuna and Ganga rivers and moved along this ecological zone to exploit their resources.⁹³ After 1000 BC drier weather conditions would have opened up more areas of the Ganga-Yamuna doab for agriculture and settlement with the attendant result of demographic growth. Pushed by the need for more arable land and pasture the Indo-Aryans continued moving eastward along the semi-arid and well-watered zones. Along their migratory route through the doab they would have encountered landscape and ecological settings not dissimilar to their earlier homelands in the drier part of the Punjab. Furthermore, the dry weather might have assisted them by thinning the jungles in the humid parts of the Ganga plain and making it easier for them to reclaim the fertile floodplains of the Ganga, Ghaghara and Gandak rivers as they moved eastward.

The need for both arable land and pasture would have lured the migrant population toward the floodplains and it is possible that following the Ghaghara and Gandak rivers they would have reached the Himalayan foothills to the north of the Ganga where the fertile older alluvium and prairie-type soils abounded. This was the region where the early ganasanghas were formed before the age of the Buddha. In the existing literature, migration toward the Himalayan foothills has been explained in terms of the endeavours of the later Vedic Aryans to escape the monarchical control of the kingdom of the Kuru-Panchalas (700–600 BC) in the Aryavarta.⁹⁴ But more than monarchical control, it was perhaps the growing need for food and fodder that drove a part of the population to move from the semi-arid to the well-watered zones to the east along the Ganga. As the Indo-Aryans moved eastward onto the Ganga plain they assimilated the previously-settled groups and incorporated them into the Varna and caste hierarchy, while other earlier groups peopled the fringes of arable land and the rainforest further east and south of the plain.

From the Ganga plain the later Vedic Aryans migrated southward into the semi-arid zone probably following the drier marches along the Vindhya Range. Though historians find it difficult to ascertain the chronological sequence and the exact route for the southern migration, some hypotheses have been proposed. On the basis of the epics and Puranas, some claim that peoples of the Yadu clan Aryanised Malwa, Gujarat, Maharashtra, and Orissa. Traditionally, it is suggested that the Yadu clan lived in the vicinity of Mathura and that after being driven away by the Kuru-Panchalas they went to the south of the Chambal River to “the Cedi, Dasarna, Avanti, Mahisamati, Saurashtra, Vidarbha and Dandaka regions of pre-Aryan sedentary agricultural settlements.”⁹⁵ Rather than attributing every Indo-Aryan migration to the growing monarchical control of the Kuru-Panchalas, it seems more likely that the drier climatic conditions facilitated Indo-Aryan groups to follow the semi-arid zone towards the south

⁹³ Spate and Learmonth, *India and Pakistan*; see the adaptation from the Russian geographer Schokalskaya's map for soils on the Ganga plain, 96.

⁹⁴ Kulke and Rothermund, *A history of India*, 50–1. Also Thapar, *Early India*, 149–55.

⁹⁵ Schwartzberg, *A historical atlas of South Asia*, 163.

to reach the agriculturally more propitious regions of Malwa, Saurashtra and Vidarbha. With its huge tracts of fertile prairie soil, Malwa would have been an important launching pad for further southern migration.⁹⁶ Interestingly, all these central and southern regions fall in the rainfall zone of 30–45 inches and the agriculturally fertile river valleys would have been another potential pull factor.⁹⁷ Again, a combination of arable fields and pasture along the drier zone sustained the migrants' mixed economy as they followed the foot of the Vindhya Range southward.

Many of the areas through which the Indo-Aryans migrated had been settled since the Neolithic-Chalcolithic period, and these demographic movements gave rise to cultural interactions and linguistic borrowings between various groups of people. More important, the earlier inhabitants of the Ganga plain had an economy based on hunting, fishing and only limited food production. Though the earlier population practiced cultivation, it was fairly limited and the subsistence requirements were supplemented by foraging and hunting. The sizable pastoral assets of the Indo-Aryan migrants would have acted as a catalyst in boosting the agricultural production when they reached the fertile floodplain of the Ganga River. They might have benefited from the agricultural knowledge of the pre-existing population; evidence of this comes from the borrowing of proto-Munda words related to agricultural implements into the Indo-Aryan lexicon.⁹⁸ A switch from barley and wheat to wet rice cultivation was probably due in part to the pre-existing population's agricultural practices in the less dry, transitional zone of the Ganga plain.

Here, archaeological evidence points to the Neolithic-Chalcolithic settlements in Mirzapur, Gorakhpur and Varanasi Districts as well as in Saran and Gaya Districts in the Ganga plain.⁹⁹ The excavation of the Neolithic site at Maner, a few miles west of Patna, at the confluence of the Ganga and Son rivers, shows its wider links with the other Neolithic sites.¹⁰⁰ These sites suggest human settlement between the northern

⁹⁶ Instances from the *Mahabharata* indicate that the region of Gwalior (between the Chambal and Betwa) witnessed the branching off of many routes and arteries toward the Deccan. *Aranyaka Parvan*, 59.2, mentions: *Ete gachchhanti bahavah panthāno dakshināpatham* (from here go many roads southward) See V. S. Agrawala's introduction to Moti Chandra, *Trade and trade routes in ancient India* (New Delhi: Abhinav Publications, 1977), vii.

⁹⁷ F. R. Allchin, *The archaeology of early historic South Asia: The emergence of cities and states*, (Cambridge: Cambridge University Press, 1995), 116, for the map of mahajanapadas; for rainfall zones, see *The Imperial gazetteer of India*, vol. 26, Atlas (Oxford: Clarendon Press, 1931), 9; for the severe aridity in the Deccan, central and western India from 1000 to 500 BC, see Dhavalikar, "Green Imperialism," 22.

⁹⁸ Thapar, *Early India*, 106; for linguistic borrowings between Indo-Aryan-speakers and other linguistic groups, see George Cardona and Dhanesh Jain eds., *The Indo-Aryan languages* (London: Routledge, 2003), 29– 36.

⁹⁹ T. N. Roy, *The Ganges civilization: A critical archaeological study of the painted grey ware and northern black polished ware periods of the Ganga plains of India* (New Delhi: Ramanand Vidya Bhawan, 1983), 10–11. The archaeological finds excavated at Narhan, on the left bank of River Ghaghara in Gorakhpur District, shed some light on cultures that evolved there after the middle of the second millennium BC. See Purushottam Singh, "The rise of cultures in the Saryupar plain with special reference to excavations at Narhan," in *Old problems*, ed. Kenoyer, 243–7.

¹⁰⁰ Narayan, *Prehistoric archaeology*, 493.

edge of the Chhota Nagpur Plateau and the Ganga River, an area that was better drained and therefore more suitable for communication and food production. This stretch of the Ganga plain has yielded evidence of agriculture from the Neolithic-Chalcolithic period onward. From the Neolithic sites north of the Ganga such as Chirand, on the banks of the Ghaghara River about 7 miles east from Chhapra town, archaeologists have found evidence of the cultivation of various cereals such as wheat, barley, lentil and green gram. Evidence of paddy husks and charred grains of rice shows their familiarity with rice. The Chalcolithic people of the Sarayupar plain have also been found to have engaged in growing crops. From the archaeological excavations of these sites it has been established that the Neolithic-Chalcolithic people had combined agriculture with hunting and gathering.¹⁰¹ Later, during the first millennium BC, these riparian regions attracted Indo-Aryan migrants from the drier zones of the western and northern Ganga plain. The earlier mixed economy of the Indo-Aryans perhaps made a smooth transition to the large-scale agrarian economy as the new migrants exploited the fertile agricultural land with the help of the traction power of their cattle. Thus, an interaction of the people and resources of the arid and humid zones brought about fundamental changes in the agrarian economy of the Ganga plain during the first millennium BC. This probably explains why the urban centres, state system and social complexities developed there starting around 600 BC.

The first textual reference to migration into the areas toward the foothills to the north of the Ganga appears in the Brahmana text of *Satapatha Brahmana* (800 to 600 BC) in which reluctance was expressed to go beyond the Sadanira or the Gandak as Agni or the fire god “did not burn over” the river. Once Agni was made “to taste it [the river] through [Brahmanic] sacrifices” the Brahmins crossed the river and the region became fit for the settlement and cultivation.¹⁰² Called Videh or Mithila, this region was settled by Videgh Mathava of the *Satpatha Brahmana* and lies mostly in northern Bihar, extending up to the Himalayan foothills of Nepal. The bhangar floodplain along the banks of the Gandak would have offered sufficient arable land and pasture following which the Indo-Aryans moved up to the Himalayan Terai where the important ganasanghas or mahajanapadas of Vajji and Malla emerged around the sixth century BC. Except for a few swamps and khadar, the bhangar parts of the region are well-drained and highly fertile. Irrigation is ensured by the snow-fed Himalayan streams as well as from the precipitation during the monsoon. Except for the few months of the rainy season, the area is dry for most of the year. The topography of what today comprises north-western Darbhanga, Muzaffarpur, and Madhubani Districts is generally elevated with some low lying depressions. Until the nineteenth century, when innumerable embankments were made, the rivers in those parts overflowed during

¹⁰¹ Purushottam Singh, “Origin of agriculture in the middle Ganga plain,” in *History of agriculture in India, up to 1200 AD*, ed. Lallanji Gopal and V. C. Srivastava (New Delhi: PHISPC, Centre for Studies in Civilizations & Concept Publishing, 2008), 7–12.

¹⁰² *The Satapatha-Brahmana, According to the text of the Mādhyandina School*, Part 1, bks. 1 & 2, *Kānda 1, 4 Adhyāya, 1 Brāhmana, verses 14–17*, trans. Julius Eggeling, 2nd edn. (1882; repr. Delhi: Motilal Banarsidass, 1966), 105–6.

heavy floods but the waters quickly drained off into the low-lying areas to the southeast.¹⁰³ A settlement officer, Mr Wyatt, who conducted the survey of this region in 1847, noted that the luxuriant soil along the rivers and water-courses produced sufficient quantities of grass throughout the year for cattle and horses.¹⁰⁴ This observation gives a clear hint as to how the ancient migrants with their cattle gravitated along the grassland and reached northern Bihar and the Himalayan foothills.

The southern parts of the Ganga plain—the modern districts of Patna, Munger, and Bhagalpur—also have meadow-type soil on older alluvium along the riverbanks. The grassland along the southern banks of the Ganga has a general elevated position and is well-drained. The root systems of grasses protect the land from soil erosion during the torrential tropical rains, while the decomposition of plants supplies nutrients to the soil and increases fertility. Such ecological advantages of the region make it ideal for sedentary agriculture. Further, with an annual rainfall of around 42 inches, the areas around Patna form the heart of a transitional zone between the higher rainfall zone to the east and north and the drier area to the west.¹⁰⁵ Thus, the accessible dry areas with the possibilities of irrigation along the banks of the Ganga would have been very suitable for wet rice cultivation. A shift from wheat and barley to rice cultivation enhanced food production and laid the material basis for early state formation in the Ganga plain. Exploitation of the resources of dry and humid areas played a critical role in giving solid political foundations to the ancient mahajanapadas such as Magadha and Anga. In a way, the location of Magadha forms one of the last outposts of “the much wider, frequently broken, ecological continuum sometimes called Saharasia which includes all the drier zones of Eurasia.”¹⁰⁶ “Saharasia” extends from the Atlantic coast of North Africa and reaches all the way up to the eastern and southern parts of the Indian subcontinent.

Interestingly, the mahajanapada of Magadha was located along this stretch of the Ganga plain, to the south of the river, at the interface of comparatively arid and humid zones. From this strategic location and by exploiting local resources such as iron, war-elephants and wood, the mahajanapada of Magadha emerged victorious over other kingdoms of the Ganga plain. In the centuries preceding the emergence of Magadha as a large empire under the Mauryans, there were serious efforts to extend agriculture. While dry accessible areas within the easy reach of river irrigation were

¹⁰³ To form a general idea of the topography and landscape of this region, see the settlement reports by J. H. Kerr, *Final report on the survey and settlement operations in the Darbhanga District, 1896 to 1903* (Calcutta: Bengal Secretariat Press, 1904), 5–9, and for a succession of highly fertile and richly-cultivated upland in Muzaffarpur District, see C. J. Stevenson-Moore, *Final report.... the Muzaffarpur District*, 9–12.

¹⁰⁴ Stevenson-Moore, *Final report.... the Muzaffarpur District*, 9, quoting Mr Wyatt.

¹⁰⁵ H. Coupland, *Final report*, see p. 4 for 42 inches rainfall. Another source based on “Report, Indian Irrigation Commission,” gives an annual average figure of 43 inches rainfall for the districts south of the Ganga such as Patna, Gaya and Shahabad, see Malabika Chakrabarti, *The famine of 1896–1897 in Bengal: Availability or entitlement crisis?* (New Delhi: Orient Longman, 2004), 46.

¹⁰⁶ Gommans, *Mughal warfare*, 10; also see, J. J. L. Gommans, “The silent frontier of South Asia, c. A.D. 1100–1800,” *JWH* 9:1 (1998): 4.

easily brought under the plough, an increased use of iron tools would have assisted in clearing tropical *sal* (*Shorea robusta*) forest in the more humid and higher-rainfall zones.

In the South Asian context, iron technology is assumed to have appeared around 1200 or 1100 BC and in the Painted Gray Ware culture (PGW, dated between 1100 BC and 500 BC) the use of iron technology diffused further.¹⁰⁷ Historians and archaeologists debate whether the adoption of iron technology in itself would have been enough to bring about large-scale political and economic changes. However, there is general agreement that when iron technology was exploited under a particular political and economic system it played a crucial role in agricultural expansion and surplus production. In the course of the first millennium BC, the proliferation of iron technology appears to have been slow and protracted. While few iron implements have been reported from the PGW sites, Northern Black Polished Ware (NBPW, dated between 700 and 200 BC) sites such as Atranjikhara in the Ganga plain have yielded a number of agricultural implements such as sickles, spades, ploughshares, hoes, and so on. The increasing number and variety of agricultural tools clearly indicate that farming had become an important economic activity. In the later Vedic period, the *Yajur Veda* refers to a field ploughed by “teams of a dozen oxen.”¹⁰⁸ Animal traction power, an important asset long since available to the essentially pastoral-nomadic Indo-Aryans, would have partly met the large labour requirements of paddy cultivation.

As Vibha Tripathi suggests, a Jain text of around the third century BC mentions paddy transplantation techniques in Rajgriha, Magadha, Mithila and Anga where the older alluvium and prairie soils particularly suited rice cultivation. New techniques of intensive agriculture probably point to the growing need for food to support artisanal as well as other non-food producing classes. The rice-economy made available a higher calorie intake and increased the human fertility leading to demographic rise. According to Tripathi an “imminent rise in the population” led to the expansion of settlements away from the riverbanks to other sources of water such as lakes and marshes.¹⁰⁹ Such expansion of settlements around 400 BC (which climatologists believe to be a period of scant rainfall) would have put extra pressure on the available sources of water. In the drier climatic conditions, more humid areas would have been reclaimed for cultivation and settlement.

Often, it was local communities that channelled their efforts for land reclamation, agricultural extension and hydraulic works, and not necessarily the “hydraulic societies” based on centralized state control as suggested by Karl A.

¹⁰⁷ On the basis of new archaeological findings, Chakrabarti suggests the use of iron in parts of the Ganga plain from 1800/1700 BC. Dilip K. Chakrabarti, *The Oxford companion to Indian archaeology: The archaeological foundations of ancient India: Stone age to AD 13th century* (New Delhi: Oxford University Press, 2006), 292–301. Even if iron was used at such an early date, it did not bring about economic transition until the mid-first millennium BC.

¹⁰⁸ Schwartzberg, *A historical atlas of South Asia*, 163.

¹⁰⁹ Vibha Tripathi, “Agriculture in the Gangetic plains during the first millennium BC,” in *History of agriculture in India*, ed. Lallanji Gopal et al., 356–59.

Wittfogel.¹¹⁰ Since paddy crops needed more water, irrigation projects, dam-building and river embankments required labour mobilization at the community level. While the state could support the collective efforts of peasants in terms of tax remissions for building dams and undertaking similar irrigation works to enhance agricultural productivity—and, by extension, tax collection—such endeavours by peasants cannot be solely attributed to centralized political authority.

As noted already, the availability of strategic assets such as iron and elephants in the hilly and forested zones to the south would have facilitated the rise of Magadha and, in later centuries, the Mauryan and Gupta empires. From the comparatively drier location of Pataliputra rulers could project their power onto the Ganga plain and beyond. While the productive agrarian heartland of the plain furnished revenue, pottery and other craft productions and long-distance overland and overseas trade were other sources of income. The overland route led towards the north-western parts of the subcontinent while the Ganga provided an outlet to the overseas trade from the Tamralipti port on the Bay of Bengal.¹¹¹ The imperial capital of Pataliputra not only controlled these route systems, it also projected imperial power over the entire Ganga plain during the late first millennium BC and early first millennium AD.

The Indo-Aryan penetration in the humid zones of the delta was slow and came about much later. Archaeological evidence attests to the existence of settlements going back to prehistoric times. Pandu Rajar Dhibi (literally, the place of the Pandava kings of the *Mahabharata* epic) in the floodplain of the Ajay River in Burdwan District of West Bengal has yielded evidence of habitation from at least 1500 BC. Excavations at this site exhibited three cultural phases belonging to Chalcolithic culture, the Iron Age and the early historic period respectively.¹¹² Copper objects of the Chalcolithic Age have been found at locations such as Parihati village in Midnapur District. As has been suggested by Dilip Chakrabarti, the settlement sites chosen by the Neolithic-Chalcolithic settlers laid the basis for future habitation sites and they continued to be peopled by subsequent settlers.

Thus, the historic urban centres of the humid zone in the Ganga plain such as Kotasur, Mangalkot, Pokharna, and Tamluk all had a Chalcolithic and/or Iron Age

¹¹⁰ Karl A. Wittfogel, *Oriental despotism: A comparative study of total power* (New Haven: Yale University Press, 1957). In community-based irrigation works, known as the *gaom* system, one adult from every family benefiting from irrigation volunteered for the repairing works of dams and embankments in Patna District. Though the system was regulated by the zamindars, the participation of villagers was customary, see Coupland, *Final report*, 2; see also Gyan Prakash, *Bonded histories: Genealogies of labor servitude in colonial India* (Cambridge: Cambridge University Press, 1990), 21–25; Nirmal Sengupta, “The indigenous irrigation organization of south Bihar,” *Indian Economic and Social History Review (IESHR)* 17:2 (1980): 157–90.

¹¹¹ Steven G. Darian, “The economic role of the Ganges to the end of Gupta times,” *JESHO* 13:1 (Jan. 1970): 62–87; Chakrabarti, *Archaeological geography*, 125.

¹¹² V. K. Jain, *Prehistory and protohistory of India: An appraisal (Paleolithic–non-Harappan chalcolithic Cultures)* (New Delhi: D. K. Printworld, 2006), 169–70. See also Chakrabarti, *The Oxford Companion*, 261–3, and Reba Ray, *Ancient settlement patterns of eastern India: Pre-historic period* (Calcutta: Pearl Publishers, 1987), 280–84.

base,¹¹³ and later these sites attracted migrants from the drier parts of the Ganga plain from about the late first millennium BC. The Brahmanic textual sources of the later Vedic period showed contempt for the lower Ganga plain and such sentiments continued to be expressed in the Buddhist and Jain texts of the later period. Still, we find many ancient historical settlements in Bengal, including the Buddhist site of Paharpur on the Atrai River (in Bangladesh), Mahasthangarh or Pundravardhana on the Karatoya River, Mainamati, Chandraketugarh and so on.¹¹⁴ These settlements assumed an urban character and the Mauryan punch-marked coins circulated from around the third century BC. Archaeological finds and literary texts attest to the maritime seafaring activities as well as agrarian expansion in the region from the late first millennium BC and during the early centuries AD.¹¹⁵ Indo-Aryan penetration of the delta was possibly accentuated by the need for more irrigated agricultural land in the dry period around 400 BC as well as by the possibilities of overseas trade.

We get more evidence of the agrarian expansion and sedentary settlement in the delta from the late first millennium AD. On the basis of an inscription from Bangladesh, Ranabir Chakravarti suggests of “the largest known brahmanical colonization program in north India planned and designed by a political authority,” as a result of which an extensive settlement emerged in the tenth-century Sylhet area. Such settlements resulted from giving *brahmadey* (revenue-free grants) to Brahmins from outside the region to bring the swampy and forested land under the plough. In the same humid zone of the delta, according to Chakravarti the Palas (especially Ram Pala 1072–1127) resettled the war-ravaged agrarian economy of Varendri or Varendra (comprising Rajshahi, Bogra and Dinajpur Districts of Bangladesh), constructed a huge lake and imposed mild taxes to ensure continued agriculture. It has been suggested that northern Bengal had a complex agriculture-based economy from the third century BC until the early seventh century.¹¹⁶ In the subsequent drier centuries, agriculture and settlement appears to have gravitated east to a zone of more rainfall and closer to the sea.

Unfortunately, the literature on the historical dynamics of the late first millennium Ganga plain is rather incoherent and many issues such as agricultural expansion and resource mobilization by the new kingdoms are only poorly understood. Existing scholarship suggests that during this period a host of dynasties such as the Palas and Senas in the humid areas of Bengal and the Gurjar-Pratiharas of the dry zone

¹¹³ Chakrabarti, *The Oxford companion*, 305.

¹¹⁴ Nitish Sengupta, *Land of two rivers: A history of Bengal from the Mahabharata to Mujib* (New Delhi: Penguin, 2011), 16–24.

¹¹⁵ Suchandra Ghosh, “Business in early Bengal (pre-Gupta phase): A numismatic approach,” in *Business history of India*, ed. Chittabrata Palit and Pranjal Kumar Bhattacharyya (Delhi: Kalpaz Publications, 2006), 77–86, for the archaeological finds of the Kushana coins that might have reached Bengal by way of trade. The existence of Kharosthi-speaking merchants and agriculturists from the north-western parts of the Indian subcontinent has also been noted by Ghosh. Reference to *Kodihalika*, that is a person having 10 million ploughmen, probably indicates the agrarian expansion in ancient Bengal.

¹¹⁶ Ranabir Chakravarti, “Natural resources and human settlements: perceiving the environment in India,” in *The world in the year 1000*, ed. James Heitzman and Wolfgang Schenkluhn (Lanham: University Press of America, 2004), 54–55, 61.

emerged in the Ganga plain. Others such as the Chandelas and Kalachuris in the drier parts of Malwa and the Rashtrakutas in the semi-arid zone of the Deccan were all vying for a larger share of territory. Around the turn of the millennium, the fragmentation of political power continued across South Asia as Hindu Shahis, Chandelas, Kalachuris, and Paramaras contended for hegemony. The proliferation of numerous dynasties from the later centuries of the first millennium AD may be understood in terms of agrarian expansion, colonization of far-flung areas and efficient hydraulic management to make up for the deficiencies in water supply that resulted from a drier climate. While the resource base of these dynasties was adequate to run their smaller kingdoms, in itself it was not sufficient for any of them to control the entire Ganga plain and South Asia. Another problem lay in their lack of access to an uninterrupted supply of warhorses and new techniques of warfare. As a result, none of these feuding kingdoms could establish and hold their political hegemony over a large part of the Indian subcontinent. They were easily swept away by the cavalry of the Turko-Afghan warriors by the thirteenth century.

As we discussed above, the transitional zone of the Ganga plain centred in the geographical area of modern Bihar proved to be the locus of early state formation where large empires of Mauryas and Guptas had flourished. In the latter half of the first millennium AD the transitional zone appears to have ceased to be the centre of any large scale political and economic activities. While the dry climatic conditions favoured the delta as an advancing frontier for agrarian expansion and colonization, new modes of warfare privileged the arid marches from where political power could be projected toward the agrarian society of the humid zone. Agrarian expansion and land reclamation in the arid zone received momentum from about the eleventh and twelfth centuries, probably aided by more propitious rain and a moist climate. Contemporary inscriptions as well as Jain sources from Rajasthan and Gujarat attest to the hydraulic projects aimed at storing water and using them for agriculture.¹¹⁷

Apart from agriculture, the typical economic activities of the dry zone included breeding such animals as horses, cattle, sheep, and the newly-introduced camels and dromedaries, which further augmented resources.¹¹⁸ As the economic lot of the people in the drier zones improved somewhat, they ventured out with their mobile resources (war-animals, arms and cash) and were able to undermine the existing political order in the humid areas of sedentary agriculture. The movements and conquests of Turks, Afghans and Rajputs in the first half of the second millennium AD may be seen in the light of their capacity to impose political domination over more prosperous agrarian societies. Long-distance connections, new technologies, animals and cash brought in by mobile forces injected vigour into the agrarian economy of the humid zone. For

¹¹⁷ Chakravarti, "Natural resources and human settlements," 55–57.

¹¹⁸ In the context of Central and West Asia, this point is nicely driven home by Bulliet. A significant economic activity followed animal herding from the arid zone to the north-western Indian subcontinent. According to Bulliet, the one-humped camel came to northern India along with the Ghaznavid campaigns that would have required thousands of baggage animals. Bulliet, *Cotton, climate, and camels*, 113.

example, the Afghan horse traders, banjara transporters, and other mobile groups linked the fairs and pilgrimage centres of widely dispersed areas spanning the arid and semi-arid zones of South Asia.¹¹⁹ Many urban centres developed and towns grew up in the wake of the establishment of the Delhi Sultanate. The Ganga plain once again experienced agricultural and economic growth and dynamism after the so-called second urbanization during the second half of the first millennium BC. Areas at the interstices between the drier and humid zones such as Jaunpur, Sasaram, Maner and Hajipur became new centres of state formation and economic activities in the first half of the second millennium AD.

Conclusion

In the entire Ganga plain, the productive capacity and fertility of the well-watered semi-arid zone is beyond doubt. Without external stimulus in the form of cattle, technology and liquid money, productive capacity in itself does not sufficiently explain state-formation and urban developments. This discussion of the large-scale economic and political transformations in the Ganga plain between the second half of the first millennium BC and the first half of the second millennium AD has revealed numerous changes in the economy and polity heralded by the meeting of people and resources from the arid and humid zones. Early state formation in the transitional zone of the Ganga plain largely depended on the exploitation of resources in both the environmental zones. In the early second millennium AD, Turks and Afghans from the Arid Zone represented the so-called horse-warrior revolution and they succeeded in establishing their political dominion over the productive and agriculturally rich humid parts of the Ganga plain. Although the process was disruptive politically, the access to new resources such as horses and cattle, links to long-distance markets, new skills and irrigation technologies had far-reaching economic consequences for the humid areas.

Another point to stress is the problems inherent in interpreting the history of this region in terms of the modern geographical division of the Ganga plain. A simple twofold division based on rainfall variability and aridity proves to be a more useful model for historical explanation rather than the threefold conventional geographic division. To test this model, I have described the historical developments and state formation in the transitional zone of the Ganga plain in Bihar. We noted that the regions further south of the river were comparatively dry, hilly and agriculturally less productive while the fertile lands along the southern banks of the Ganga and the plain to the north of the river were rich in agricultural resources. Therefore in this strategic zone of Bihar, the state-formation processes unfolded in the early historical, medieval and early modern periods successively. It was from this transitional environmental zone that the Mauryas and Guptas had held sway over the entire Ganga plain in the ancient period. The area remained strategically significant during the so-called medieval period. In the fifteenth century, the Sharqis of Jaunpur and in the sixteenth century Sher

¹¹⁹ Gommans, "Silent frontier," 9–10.

Shah of Sasaram displayed great potential for political consolidation of the plain from the relatively dry zone. As I hope to demonstrate in this study, the transitional environmental zone remained crucial to the process of state-formation when agrarian expansion, resource generation and commercialization of the economy peaked between the sixteenth and eighteenth centuries, and when the Mughals were mostly the dominant political power.

Proceeding to the “Age of Commerce”, in the following chapter I shall discuss the natural infrastructure that facilitated the transportation of goods and movement of people along the riverine and overland arteries of the Ganga plain. The critical significance of these transportation networks lay in the fact that they not only linked the different ecological zones to the north and south of the Ganga but they also connected the humid Ganga delta and maritime spheres to the east with the drier parts to the west of the Ganga plain. Thus it becomes clear that the Ganga plain lies at the environmental crossroads that proved to be crucial for the growth of agriculture, trade and the economy generally and thus led to the generation of the stunning wealth on which the Indian empires depended and endured. Cumulatively, these factors propelled the processes of state formation in the plain. But what did these arteries of communication look like and, why were they so critical for the state and society? We explore these questions in Chapter 3.