

1 Introduction

The relatively young but rapidly expanding field of formal environmental history informs us ever more about vital patterns of interactions among humans, other living beings, and the material world. Climate change, species extinction, unequally distributed and overstrained essential resources (including clean air, energy, food, land, and water), and other of today's pressing issues can only be understood and mitigated by understanding the many centuries of dynamic changes that caused them. The Indian subcontinent¹ has a distinctively complex environmental history that makes it particularly vulnerable to current environmental stresses.

This book offers an introductory survey of the constantly changing interactions that define India's environmental history, one especially rich in primary sources and secondary scholarship. Starting with the geological and climatic origins of the subcontinent itself and ending at the present, this book's vast chronological scale means it must be thoughtfully selective. Further, each of India's many diverse regions has its own distinctive environmental history, so this study's massive geographic scope means its examples must be illustrative. Yet, these broad historical patterns collectively define a distinctive part of the world. Throughout this long history, we particularly focus on how various cultures (including religions) and states altered, perceived, and adapted to the nonhuman world and tried to control it through their available technologies and ideologies.

Environmental history raises questions for us all to consider. For instance, many people today might identify groundwater in an aquifer as "natural." But what about that same water, unchanged chemically, pumped out and commercially packaged in plastic bottles with a printed label asserting it is "natural"? After being consumed and voided as liquid waste into a river, for instance the Ganges? Many in India today identify

¹ As the context indicates, this book uses "India" for the South Asian subcontinent until 1947 and, post-1947, "India" for the Republic of India alone.

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the Ganges from a Hindu religious perspective as eternally pure, while many “natural scientists” (including devout Hindu ones) using a chemical and biological perspective would label it as unnaturally polluted. Nor are rivers “naturally” stable, for example, they meander over time, frequently shifting their channels and beds even without (or despite) human intervention. Such different perspectives hold significant implications for implementation of government programs (e.g. the Indian government’s massive, ongoing Ganges Action Plan to clean up that river). Thus, with reservations, this book uses the term “natural” in contrast to “anthropogenic” (meaning human formed or transformed) and shows how diverse people at different times applied their distinctive cultural values to the living and nonliving environment.

Other examples of conflicting perspectives arise, for instance, from recent big dams and reservoir projects (like the controversial Sardar Sarovar Dam on India’s Narmada River and the Diamer-Bhasha and Dasu Dams on Pakistan’s Indus). Their supporters present these projects as triumphs of human engineering, harnessing nature to channel vital irrigation water to arid lands, prevent devastating floods, and produce pollution-free hydroelectric power essential for national development and poverty reduction. Simultaneously, critics condemn these same dam projects as causing the unjust displacement of local human populations, submergence of rare flora and fauna habitats, drowning of sacred sites, distortion of siltation and fish migration patterns, land degradation from salinization and waterlogging with waterborne disease proliferation, and, overall, long-term irreversible ecological damage.

Indeed, humans have always made efforts to value, understand, and interact with the environment. Over millennia, competing communities and states have developed technologies and bodies of knowledge (“sciences”) for transforming “useful” or “dangerous” animals, plants, and other parts of the world around them. Each society conceives of and values specific species and geographical features in its own ways. Over time, these models for India’s environment have often been articulated through religions and enforced by rulers (two of this book’s continuing themes).

People in India have long devoted much thought to the environment around them, both what we might consider the sacred and also the material worlds. Indeed, people recorded their observations of India’s environment in its earliest surviving sacred texts: the Sanskrit-language Vedas (Chapter 3). Later Indian authors, often patronized by rulers or religious leaders or communities, studied and described selected aspects of the environment (preserved in Sanskrit Shastras and popular-language Hindu, Jain, Buddhist, and Dravidian texts; see Chapter 4). New

immigrants and cultures (including Islam and Christianity) added to people's perspectives and knowledge about India's environment, and new genres of writing about it often produced thoughtful and detailed descriptions and analyses of the climate, specific species, and human interactions with these (Chapters 5–7). During the British colonial period, European and Indian officials (often using European-style scientific training) began to compile ever more extensive records and to formulate policies of regulation about what they considered key aspects of India's material environment, including weather and disease patterns, reductions in valued hardwood species, and pollution of air and water supplies (Chapters 7–8). The level of recordkeeping and regulations about the environment increased even further in the independent nations of India, Pakistan, and Bangladesh (Chapters 9–12). But the formal discipline(s) of environmental history largely emerged during the late twentieth century as various scholars created and advanced models and methodologies.

Humanities- or social science-oriented environmental historians use sources, methodologies, and approaches featured in their specific discipline. Some individuals, approaches, or schools of thought tend to concentrate on cultural or intellectual issues, while others concentrate on material, technological, or economic ones; still others focus on political policies, laws, or judicial interpretations of these. Often scholars specialize in analytic methods, examining the source material of a particular type about a specific topic (e.g. forests, water, cities, railways, agriculture, or one animal species), in a particular language, and from a particular region and period. Historians of religion and literary scholars, for instance, often use specific bodies of written or oral sources that reveal how those communities valued the living and nonliving world around them. Some commentators argue that today's movements or public policies that incorporate reverence for sacred rivers or sacred groves, or understand their own religion as inherently environmentalist, will prove more effective than mere secular ones. Sociologists often work on contemporary resource allocation at the level of social classes or cities, while anthropologists focus at the village or family level (e.g. how women of particular communities engage with resource collection). Political scientists tend to focus on the recent formation and application of state policies about the environment through contentious interaction among various competing interests either within society or internationally (e.g. where human or national development seems to clash with conservation of endangered wild animals and habitats or forest-dwelling communities). Many environmental historians studying the postindependence period have accepted national boundaries, considering only India, Pakistan (often omitting East Pakistan), or Bangladesh (often omitting its period

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as East Pakistan). Nonetheless, many environmental forces and ecosystems cross those political borders, even though these new nations have significant similarities and differences in their environmental histories.

A heuristic model to describe patterns in environmental history about the Indian subcontinent is through three “waves.”² Like ocean waves, there is much overlap and recycling of material, but each has its own energy and alignment. The first wave of formal environmental historians (broadly defined, starting in the 1970s) noticed and celebrated local movements that resisted exploitation of natural resources by government-backed commercial interests. For instance, a range of commentators have lauded the Chipko (“tree-hugger”) movement in the Republic of India’s western Himalayan foothills (see Chapter 10). However, these writers have attributed the prime motivation for Chipko using a range of analytic ideologies, including (among others) Marxism, feminism, or Gandhianism (e.g. Ramachandra Guha 1995; Shiva and Bandyopadhyay 1986; Weber 1989). Often such studies of contemporary popular environmental movements seek to inspire and mobilize urban elites into political and conservation engagement.

A second wave developed as scholars (within South Asia and internationally, using an array of methodologies and emphases) added historical depth to the study of the subcontinent’s environment and diverse people’s knowledge and interactions with it. Some scholars analyzed the historical development of ecological awareness, scientific and technological means of assessing and controlling natural resources and their degradation, and governmental policy formation (e.g. Gadgil and Guha 1992, 1995; Ramachandra Guha 2000b; Sumit Guha 1999). Much of this kind of environmental history writing concentrates on the British Raj period (1858–1947) since the volume of written records and the level of exploitation of India’s resources by the government and for-profit companies both dramatically increased (e.g. Grove 1995; Richards et al. 1985; Saravanan 2016; Tucker 2012). Some writers have contrasted this colonial period with a precolonial era of alleged balance between humans and nature, when even Indian rulers (like Buddhist Emperor Ashoka, third century BCE; Chapter 4) famously revered and protected fauna and flora. Some historians writing about earlier periods have also identified the same pattern of local resistance against the state and other outside exploiters (like the Hindu devotional Bishnoi community who have historically defended trees with their lives; Chapter 7) as in today’s community-based environmental movements. However, critics such as Greenough have

² Agrawal and Sivaramakrishnan (2000:8–12) write of three “generations,” but the discipline is so young that many of the first “generation” are still active.

characterized this image of an earlier golden age as using the “Standard Ecological Narrative” or the “declensionist” model of constant ecological decline due to outsiders or the capitalist world system that exhausted natural resources (Greenough 2001). Further, while providing deeper historical contexts, this approach (and policies based on its assumptions, like Joint Resource Management, Chapter 10) has been critiqued for simplifying complexities into binary oppositions (e.g. animal versus human, colonial versus pre- or postcolonial, colonizer versus colonized, culture versus nature, female versus male, indigenous versus state-imposed, traditional versus modern).

Third-wave environmental historians challenge and deconstruct all such categories, often analyzing the discourse of powerful people who created them to control non-elites culturally. Some scholars reveal internal divisions, for instance power inequalities based on gender, class, or caste within communities of “villagers” or “tribals,” or else ideological conflicts among “colonizers” or other elites (e.g. Agrawal 2005; Arnold 2016; Gilmartin 2015; Sivaramakrishnan 1999). Approaches considering comprehensive ecological webs or interspecies relations question human–animal binaries, for instance, showing how forest-dwellers incorporate special fauna or flora as ancestors or members of their communities (e.g. Govindrajana 2018). Yet other scholars show how people move among social and economic categories, like settled farmers moving into forests to escape famines or state-control and taxation, or forest-dwellers migrating to cities (permanently or just during one life-stage); activists argue that, to move forward environmentally, cross-cutting alliances and appreciation of multiple and shifting identities must be formed (e.g. Baviskar 1995). Such dynamic complexity, however, should not deter informed policy-formation or commitment to action concerning urgent environmental issues.

Simultaneously, “hard” or “natural” science-oriented historians have used different academic disciplines to study the origins and development of the physical world and its biota, either prior or subsequent to effects by *Homo sapiens*. For instance, geologists study earth processes in various eras, while biologists analyze how particular species of humans, fauna, and flora have spread, migrated, adapted, declined, or even become extinct. Some environmental scientists analyze the effects of chemical or biological pollution on the earth, atmosphere, water, or living things. Others concentrate on creating policies or projects to protect endangered species from extinction, especially by preserving (or recreating) their natural habitats. For scientists, there are “natural laws” about how the chemicals that comprise water, air, land, biota, and combustion, for instance, always act. Some historians, however, have shown how the

civil engineers and scientists have acted as the products of their time, class, culture, and gender rather than as practitioners and discoverers of universal principles or truths. This book incorporates the fruits of diverse methodologies and disciplines to provide an overview of the subcontinent's environmental history, from the earliest times into the twenty-first century.

The Shape of This Book

This volume is organized chronologically, with each successive chapter addressing a more concentrated period in India's environmental history. The chapters highlight broad patterns, particularly featuring religions and governments since they have the coercive ideological power and larger-scale organizational authority to affect most extensively the relationships among various people and diverse parts of the material world. However, states were not hegemonic and were often multilayered, with much internal diversity. To be effective, public policy must reflect the consensus of people with power and those without; to be equitable, it should reflect the values and needs of the people most affected.

Readers wishing to delve deeper into the issues in each chapter should consult the Bibliographical Essay. Additionally, the List of References indicates the most important primary and secondary source material available. The illustrative maps and graphics are necessarily monochromatic, two-dimensional, and static, but the actual environment is polychromatic, three-dimensional, multileveled, and dynamic (on various timescales).

The second chapter outlines the context and early history of India's physical environment from continental drift (roughly 100 million years ago) to the arrival of the earliest people (defined as *Homo sapiens*) sometime between 75,000 and 35,000 years ago. Over these many centuries, the distinctive geology, topography, and climate of India all gradually developed from the terrestrial, atmospheric, and solar forces acting on them. Indeed, the earth is not a closed ecosystem, since it is affected by solar radiation, the sun's and moon's gravities, and the impact of asteroids, among other cosmic forces. Over time, species of plants and animals immigrated into the Indian subcontinent and adapted, as did bands of humans. Keeping in mind that one must avoid suggesting anachronistic biological continuities, this chapter also considers the culture and lives of forest-dwelling communities until the present.

Chapter 3 concentrates the two most prominent early cultures and societies in India for which there is surviving evidence. One centered on

settled agriculturalists and built cities along the Indus River (2700–1900 BCE). The other, originally nomadic herders who immigrated (starting c. 1700 BCE), mixed with the other cultures already present, and settled mainly as agriculturalists (from c. 600 BCE). As the environment shifted, each of these groups interacted with each other and the flora, fauna, atmosphere, land, and waters around them in distinctive ways.

During this process and subsequently, each politically separate region developed its own distinct natural and sociocultural ecology, which has largely persisted until today (Chapter 4). Local, regional, and forest-based cultures and communities continued to develop. Further, by about the third century BCE, several related but distinct religions had emerged, including Jainism, Buddhism, and Hinduism; each developed a model of and for the universe and the human and natural environments around them. Simultaneously, communities, cultures, and states emerged and interacted in North India, the Deccan, and the peninsular south, using developing technologies that enabled a series of states and even fragile transregional empires. Most prominently, the Mauryan Empire (c. 320–187 BCE) drew upon the especially extensive natural resources of its home region and the mobilizing principles of Jainism and then Buddhism to expand its resource control over much of India. However, this first Indian empire's technology of rule could not reach deep enough into conquered regions or Hindu society to resist regional reassertions.

India never existed in isolation. Increasingly from the eighth century CE, overland and overseas immigrants mixed with local societies and cultures (Chapter 5). These Christians, Jews, and Muslims brought their own attitudes toward the nonhuman world and their own technologies for controlling it. Yet, as these immigrants settled, they adopted and adapted many Indian social and environmental practices. Some Central Asian Muslims established sultanates, the most prominent based in Delhi, which tried to extend their power over the subcontinent, its people, and its other resources. Meanwhile, other regional states, most prominently Vijayanagara in the Deccan, built their own economic and political systems.

The Mughal Empire (1526–1858) proved to be the largest and most powerful state to that point in Indian history (Chapter 6). Particularly under the innovative and dynamic Emperor Akbar (r. 1556–1605), the imperial administration developed unprecedented means of measuring, assessing, and using India's resources. Following Akbar, three successive emperors elaborated on his foundation, not always effectively. Portuguese armed merchants had already reached India in 1498, and

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they began to link it with the burgeoning Eurocentric world system, including by importing plant and animal species from the Americas.

Over the eighteenth century, as the Mughal imperial system fragmented, diverse competing regional rulers sought control over India's resources (Chapter 7). These rulers used various models for their relationships with human and natural resources under their power. Ultimately most successful of these rivals was the English East India Company (established 1600), which gradually intensified globalization through more rapid and extensive movement of people, flora, fauna, minerals, and technologies to try to master the Indian environment. Especially from the late eighteenth century onward, some Indian and European scientists began systematically recording and correlating detailed evidence about rainfall, temperature, deforestation, and diseases, and then used a variety of approaches, methodologies, and sources to advance diverse arguments into what would later be called environmental studies.

More than any previous state to that point, the British Raj (1858–1947) imposed its authority over all of India, using sciences and ideas that exploited, divided, but also unified the subcontinent (Chapter 8). Key markers of colonialism include rapid, state-sponsored expansion of land under cultivation, water control, timber harvesting with consequent deforestation, and extermination of particular species of wildlife (deemed either vermin or trophy game). By building railways and canals, and through “scientific forestry,” the British Raj altered diverse aspects of the environment to unprecedented extents. Many contemporary supporters of the British Raj lauded it for harnessing or conquering nature and advancing India into modernity. Concurrently, however, a variety of South Asians developed alternative political, social, and environmental models, the most prominent of these being Mahatma Gandhi.

Chapters 9–11 address the subcontinent's environmental history over the past seventy years, concentrating especially on the relationships between the newly independent states of India, Pakistan, and (from 1971) Bangladesh and the material world they governed. From relatively impoverished British colonies, these newly independent nations have used their human and natural resources to make themselves major participants in the world economy, with India especially as a rising global economic powerhouse. Most environmental histories of Pakistan largely delete not only regions that became part of the Republic of India but also its own eastern wing, for instance, with statistics only counting Western Pakistan as if it were the whole country. Environmental histories of Bangladesh usually pass quickly over the “Pakistan period” and begin with their Liberation War. Most environmental historians of India stop

considering those regions that became Pakistan. However, by presenting these three national environmental histories in parallel, comparisons and contrasts (and the reasons for each) become evident.

The late twentieth and early twenty-first centuries saw vastly increasing human impacts on the land, water, and air, which many scholars identify as causing the start of the Anthropocene. The governments of India, Pakistan, and Bangladesh have each attempted to establish laws, regulations, and policies to control their citizens' use of national resources (young Bangladesh, for instance, already has more than 200 laws and bylaws that attempt to regulate aspects of the environment). These governments, plus corporations and individuals, have deeply redirected the subcontinent's surface-water and groundwater flows through massive and small dams, extensive perennial canals, and vast numbers of power-driven tube-wells. They seek to generate hydropower, supply major industries, provide people's drinking water and waste disposal, and support agriculture's new high-yielding crops. In addition to extensively expanded irrigation, much farming has been transformed by mechanization and hybrid (and, more recently, genetically modified) crops, enabled by access to financial credits and extensive use of subsidized water, chemical fertilizers, and pesticides. Today, anthropogenic floods, droughts, and salinization cause increasing economic and environmental costs, while relatively little freshwater remains unused and unpolluted, so water scarcity is getting worse. Rising air contamination, continuing deforestation, and accelerating species extinctions remain problems across South Asia. Simultaneously, popular movements, civil-society organizations, and central and provincial legislatures, administrations, and judiciaries in India, Pakistan, and Bangladesh have made extensive efforts to conserve natural resources and yet also use them for much-needed poverty alleviation and economic development.

The three governments have assiduously participated in the growing numbers of international treaties, conventions, and protocols relating to the environment. Rich nations, international NGOs, and other organizations (like the United Nations) have given advice and financial aid and exerted diplomatic pressure to shape the policies and programs of these three governments. Yet, implementation of these international, national, and provincial laws and policies remains difficult. Violent and nonviolent social and economic tensions are interconnected and arise from unequal access to ecosystem resources and participation in democratic processes in all three nations (although to different levels at different times). As the global, national, regional, and local range of environmental options expand in some key ways and contract in others, South Asia will remain a vital arena. An emerging twenty-first-century goal for many (but not all)

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governments and organizations is sustainable and equitable human development that will conserve the natural world as much as possible.

The conclusion (Chapter 12) briefly considers three current environmental issues for the nations of South Asia, individually and collectively. To focus on the distinctive and the similar conditions within India, Pakistan, and Bangladesh, this chapter first looks at urban conditions and challenges. Next, the ship-breaking or ship-recycling industry in each of these nations provides an example of their competing roles within the global environmental system. To encapsulate the distinctive international approach of each government and nation, this chapter compares and contrasts their respective promised Nationally Determined Contributions to the mitigation of global climate change and its effects within the United Nations Framework Convention on Climate Change.