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a symposium on

human-environment relations

in the long term

symposium participants

The problem

THE twenty-first century has brought concerns about the future of the earth and human-nature relations to centre stage. This has happened in ways that make the environment as a theme ubiquitous in our lives. Leaders of both the industrialized and emerging economies talked across the table on global warming in Copenhagen in 2009 and will do so again in Paris later this year. This is a far cry from the first UN Conference on the Human Environment at Stockholm in September 1972 that was attended by only two heads of government from Sweden (the host) and India. It is also unlikely that any world leader would repeat the words of the late Ronald Reagan that, 'If you have seen one redwood, you've seen them all.' Today, leaders in polities as diverse as Russia and the US, China and South Africa, vie to win for themselves the tag of being earth friendly, green and caring.

Needless to add, public rhetoric is not always easy to match with action. All nation states and peoples share the same planet but rarely the views on its future. Stockholm saw a divide between those who claimed population as the problem and others who saw inter-state inequity as a root cause of environmental decay. Today, the same divide assumes a new form. The fulcrum of the world economy is moving from the Atlantic to the Asia-Pacific with countries like India and China emerging as global economic players for the first time in over three centuries. In the last decade, the BRICS countries (still only a fifth of the global Gross World Product) have been the engines of economic expansion. Countries once under imperial domination may differ in many fundamental aspects, but together they share their refusal to pay the environmental costs of other countries' industrialization. This is the case with Brazil and South Africa, India and China.

The post-Cold War expansion of economies opens up new opportunities for a better life for many, but also takes forms that deeply strain the web of life and nature's cycles of renewal and its mechanisms of repair. Richard Tucker's lucid history of the US impact on the tropics was titled *Insatiable Appetite*. Rubber and fruits, timber and beef demand in the country that accounted for over 40 per cent of gross wealth product in the mid-20th century (and just under half today) remade the land, water, flora and fauna of the tropics, often in deeply damaging ways. Over eighty years earlier, a prescient Mahatma Gandhi wrote to the left wing Indian advocate of industrialization, Saklatwala, on the larger implications of India following the development path of England. It would, he confidently asserted, strip the earth 'like a pack of locusts.' No doubt his words in 1928 ring true, but it is also difficult for any formerly colonized country to ignore the hard reality that political freedom to be meaningful needs the artifices of economic growth to protect and sustain it.

The fact is that the idea of a path away from an industrial order, though it has many adherents, has rarely won space in the plans of those who rule and seek to guide the destiny of states. Stalin's dictum that if his country did not catch up it would be reduced to a cipher, has takers in many who find little else attractive in the Soviet dictator. 'Catch up' often entails conquering internal frontiers. This has been the leitmotif in Brazil (which saw the Amazon as a frontier), in China (as in the desert and plateau regions) and in Indonesia (where mass resettlement was aimed to unify and weld together its peoples). Surprisingly similar collisions take place at another location of the development spectrum. Internal frontiers and marginal regions are also present in countries like Australia, Canada and Sweden, where extraction of gas, timber and minerals makes few exceptions for landscape damages and local community priorities.

If the 20th century was about the rivalry of an ascendant American power, with militarism in the first half and state socialism in the latter, there is little doubt that a rising Asia will see more, not less, intensive resource use and higher levels of material deve-

lopment. Will the newly rising powers avoid the kind of resource destructiveness of earlier powers and how far can they moderate their impact without giving in to an upstairs/downstairs world?

The larger dilemma is how to evolve in ways that lessen or moderate the ecological footprint of peoples and societies. Are there other, better ways to generate wealth in a manner that does not rupture the webs that sustain life? It is a positive sign that debate has moved beyond alarmism and denial to look at why, how and when changes took shape in the past. This is essential for a better future. The past cannot give any easy 'turn-key' lessons but can generate insight indispensable for all. We need the long-term view into the past in order for us to find a long-term sustainability into the future.

Increasingly, this has meant a dialogue across the traditional divide of the humanities and the natural sciences. The complexities of the natural world and human social life demands studies in which we need to understand and connect across the scientific terrain. The interconnection of species and interrelation of the atmosphere and life forms of earth requires an informed analysis of how the knowledge of science mediates human action. The determinism imbued in arguments of how human futures are trapped by nature's forces needs to be confronted by an understanding of how societies in the past dealt with large-scale disasters, pollution, and waste. Scientists need to integrate complex social analysis into their work. The humanities in turn can gain much by drawing on scientific insights even as they make us sensitive to multiple, often contested, ways of knowing nature. It is not a question of keeping to either of the favoured long-term perspectives into the past – of preferring the emergence of humankind, the agricultural revolution, the introduction of fossil fuels, or the European exploitation of global resources on other continents. We need a multiple vision of time as we understand the challenges of the present. In short, we need to speak across and beyond disciplines.

This is easier said than done. The planet is one unified ecological entity, a home of life powered by the sun. Yet, it is divided into different nation states. Political borders of nation states (or former empires) by which research is often organized, funded or conducted can scarcely do justice to ever-changing markers across land- and waterscapes. Monsoons, earthquakes, or migrating birds make no exception for such borders. Nor do people. Looking at longer-term trajectories – labour, knowledge, capital, and goods have flowed across landscapes irrespective of politically bounded spaces; they have moved with or against tides and natural ruptures. This has been especially true in recent centuries, periods when the global wealth (the gross world product) doubled (1500-1800) or when it rose fourteen fold (1800-1900).

But even these changes cannot be seen in isolation in time and space. New historical and archaeological works indicate considerable landscape shaping by use of fire by early hominids, and the colonization of islands, as in the Indian Ocean, even many centuries ago, led to large-scale extinctions of local fauna unable to adapt to new pressures. Not all changes were entirely negative and much of southern Africa and South Asia had extensive grasslands remade by a mix of anthropogenic and natural influences, so much so that it is difficult to draw a line between the two. Even many plant cultivars (yam or cassava or sugarcane) or trees now gone wild (such as neem in mainland India) or animals (such as the grey squirrel in England or the dingo in Australia) spread due to human interventions in history.

Fluidity is a fact of human history. Economic exchange and human mobility has cut across bounds of empire and nation state. Unsurprisingly, new historical works go a step further and often cut across boundaries of space, time and species in a search for better explanations. Maize, in its march across Africa post-1492, became a major factor in changing more than just nutrition and food habits. The Bay of Bengal unified,

not separated, the east coast of India from South East Asia, with migrant labourers remaking lands and waters to create a sense of home. Import of horses across the western Indian Ocean and the central Asian land routes was a major factor in South, Central and West Asian history for centuries, as they were paid for in coin. Domestic animals taken from India for the British forces in the 1890s may have helped the rinderpest virus hop across the waters, leading to a huge dying-off of the wild ungulate herds. On a more prosaic level, the plague virus taken across the Eurasian land mass in the mid-14th century brought demographic collapse in its wake, sparking fears similar to AIDS in the 20th century and ebola in the 21st. Mosquitoes and the diseases they spread played a greater role in 18th and 19th century wars in the Americas than those in battle may have suspected. And the potato and its spread helped revolutionize agriculture across much of Europe and Asia in more ways than any one might have imagined in its native home in the Andes. Plants and pathogens, succulent tubers and sturdy mounts, shade giving trees and edible feral animals, are all part of our connected and ever changing history.

The flow of commodities and cultural contact has had deep impact on the ecosystems of the earth in ways often little realized. The markets for opium in China, integral to Pax Britannica in the triangular trade, powered the transformation of fields in Malwa and market places of Bombay. Rubber making a trans-oceanic trip from its native home in Brazil was part of Britain's struggle for empire.

In another era, much of the Mughal power was built on its ability to be the hinge between Monsoon India, with the rice paddies and densely settled people and Arid India, with wide open spaces and herds of horses and cattle. The Mughal, Safavid, Ottoman and the Ming/Manchu empires in the 16th and 17th centuries accounted not only for a disproportionate share of the world's wealth, they generated enormous demand for resources from afar. Jahangir's court in Agra (1608-28) brought in narwhal whale ivory from the Arctic, goshawks for hunts from Europe, horses from central and West Asia and shatoosh wool from the cold plateau of Tibet. Estimates of China and India's share of the global wealth in 1700 place it at 55 per cent.

There is still little doubt that the era of European dominance, based as it was on maritime power and control of sea routes and powered by merchant capital, was qualitatively different from many earlier land based empires. There was no one Vasco da Gama moment when dominance was established, but there is little doubt that between the late 18th and the mid-19th century, there was a decisive shift of power.

Two large ecological changes signified this: the hunting down of Africa's elephants for ivory to make piano keys in Europe and the diminution of the great whales by steam powered ships with harpoons for whale oil. Less noticeable, but presciently pointed out by a pioneering environmentally minded economic historian Malcolm Caldwell in his *The Wealth of Some Nations*, were two other developments. The British built the first coal fired empire in history and yet, even before its collapse, there was a qualitatively new power in place. This was the United States which had few direct colonial possessions but relied on economic and military power over other states. More important, its main fuel source was oil and gas. At the end of WW2, the US accounted for 45 per cent of the gross world product.

Yet, as is often the case, empires not only exploited resources, natural and human; they also created controls, often for self-interest. Trautmann's recent work argues that elephants as a source of war animals were part of a four-cornered relationship in early India – between kings, forest peoples, other peoples and the elephants. Though this was most pronounced in India by the 3rd century BCE, there were similar trends at work in other Asian societies. More recently, it has been argued that early European island colonies were in favour of controls on land, water and forest use lest changes in the water cycle lead to dearth and disorder. The US, in its ascent to global power from the 1890s to the 1940s, took steps to alleviate overuse of vital strategic resources. The creation of the Forest Service (1900s) and the National Parks (1876), and even earlier, the protection of the bison (or American buffalo) and the treaties to protect migratory birds in the Americas were steps in this direction. In Bolshevik Russia, the early post-revolution years saw Lenin sign a law for protecting rare fauna in 1919. Within a decade, Africa had its first parks in the Virungas (Congo) and Kruger (South Africa) and India soon followed in 1935 with Hailey, now Corbett Park.

The relationship of power to exploitation and protection was both complex and multilayered. New works show how many parks from America to Africa rested on assertion of dominance over nature by white settler states over resident peoples. Often saving nature also meant the obliteration of rival livelihoods and cultures, a process that finds echoes in the still intense conflicts and contests over access and control. What is important is the deeper historical process that underlies not only conflict zones but also often circumscribes the kinds of cooperation that are workable or practical.

One consequence of the dialogue of the historical and ecological disciplines is that geography and history are once again on speaking terms. The new awareness that we live on one planet is graphically captured in the iconic photo from Apollo Seven of a green blue planet against the darkness of space. It is also evident in ways in which even specific focused studies in anthropology and history, ecology and planning, now draw links to the rhythms of nature, and the complex ways they are tied in with the consequences of human action. El Niño, first studied in the late 19th century, is now seen in conjunction with other climatic patterns as well as the changing ways in which societies adapted to them. New knowledge that brings geological time frames into contact with historical transitions in the human pasts throws fresh light on well known historical events. Geoffrey Parker argues how the two decades after 1640, a time of immense turmoil in the Mughal Empire, was also the driest spell in a thousand years, thereby connecting dearth and unrest. Richard Grove points to an extreme climatic anomaly in the late 18th century. Peaks of famine mortality coincided with the most severe and prolonged El Niño events of the last millennium. Yet alternations of dry and wet spells or of hot and cold years of the past now have an added dimension, the distinct impress of human actions that may precipitate irreversible change.

Climate change due to changing greenhouse gas levels, though first debated in 1851, today evokes wider concern and debate. So too does specie extinction, known widely since the cases of the Dodo in Mauritius or the Moa in New Zealand, but probably now taking place on a larger scale than since the five great prehistoric extinctions. The larger impact of the extensive extraction of fossil fuels, of redirecting river courses, cutting channels across isthmuses, of petrochemical production and use – all these and more raise afresh an old question. Will human ingenuity and adaptability (including conservation and environmental repair) prove equal to the task? And a larger issue: are these mere small holes in the wider fabric of nature or a tearing apart of the web that sustains life and ecological systems as we know them?

Given the rapid escalation and global scale of human induced environmental change, we need analyses viewed in the deep-time perspective. What aspects of our present times are unique and what are common to the human-nature entanglement across ages? Arguments for a return to earlier golden age landscapes, arguably with ecosystems in balance, are now more difficult to find. Human life has always made an imprint on landscapes; ancient societies too could cause large-scale landscape change. Pollen and fossil charcoal analyses in the Kruger and Limpopo National Parks show how human induced fires can have both positive and negative impacts on the changes between savannah and forest cover, depending on the vegetational phase. Similarly, in contrast to today's wildfires occurring late in the dry season, the burning of lands prior to European settlement in northern Australia was carried out for a great many purposes. Ethnographic sources and diaries show that these happened early in the dry season and contributed to a heterogeneous habitat, favouring some tree species and reducing others, including the animals that fed from them.

Forests were not only wiped out by the onslaught of human extraction for timber, woodlands also regrew. Croplands of millets and maize, wheat or rice sustained not only humans but also a range of taxa such as birds and insects, small mammals and reptiles. New research suggests far more complex human-nature relations than the simple model of degradation through the process of development.

Similarly, the deep-rooted misconception that, in former days, people tended to stay in one place – that mobility was the exception and settlement the norm – has been empirically disproved. Or, shall we say, historians have learned to listen more to archaeologists. People move and, with them, also knowledge, goods, plants, habits, disease and any other aspect of human society. Conventional perceptions of societies expanding uphill from the settled lowlands are now confronted by new research on hill-based polities expanding downhill – as from the Himalayan plateau into northern Indian foothills, to form significant polities. The movement of cattle, livelihood patterns, or farming practices alter ecosystems. On larger scales – in marine, savannah, or forest ecologies – they may be disturbed and significantly changed.

The rapid flux of capital investment has passed like a scythe through Brazilian forests, Nigerian oil fields, and South Asian mineral reserves. Such global flows are susceptible to complex influences, at times causing unexpected consequences. Opportunities for mineral extraction in the Arctic have generated expectations of large untapped oil resources, resulting in researchers and activists sounding the alarm and producing informed responses about environmental effects. But, with shale oil reserves in the US now being tapped and the Gulf countries more willing to tolerate lower selling prices of oil, extraction in the Arctic suddenly looks far less promising as capital moves away.

The deeply interlinked ecologies of water and land make it clear that rivers are as much about water as about sand. Massive amounts of sand and silt are annually spread across surrounding lands, adding fertile soil or destructive sand. Over millennia, flora, fauna and human life have adjusted. The modern infrastructure of canals and dams can barely contain such monsoonal ecologies. Added to this is the industrial and household sewage that causes the death of river courses as the Yangtze and Ganga, Yamuna and Mekong, Irrawaddy and Indus.

This issue of *Seminar* cannot answer these large issues but can help pose them in new, better, more insightful ways. Some authors address the need for long-term, deep history in order to understand critical environmental issues that are relevant today. Others are located in a specific moment in historical and ecological time, but place it in a larger perspective. What do we really mean by words like collapse and how unique is the day and age we live in? There is a less well known trope of human adaptation and recovery from adversity and it is worth asking how far it is useful to reflect on and learn from.

In a recent dialogue of regional specialists, Peter Perdue, a leading China scholar, was reluctant to view environmental crises as irreversible and pointed to longer-term cycles of recovery as in the case of shifts of capitals and populations and adoption of new crops and practices. Related to this is the idea of vulnerability: is it planet wide or species specific, and can we historicize it to make it more amenable to action or meaningful thought?

There are certain larger, secular trends that are planetary in nature. Recent decades have seen mounting evidence of the human role in climate change, not merely via the carbon cycle but other related modes of global warming, often related to the long Industrial Revolution since the late 19th century. Less spectacular, but equally critical, is the decline of species across the world's oceans and in a host of terrestrial landscapes, prompting some to compare the scale of human driven extinction to the die offs of the past, as at the end of Triassic era. A third issue which rarely figures today but loomed large in the 1980s – the impact of possible nuclear war on the global ecological system. Whichever way one looks at these mega trends, climate change, species die out and nuclear threats, the reality is these require careful and rigorous thought.

Writing in 1962 in a book that would not only warn about the threat of petrochemical contamination, Rachel Carson declaimed about 'the obligation to endure the right to know.' She was referring to the pesticides which have, as she said, silenced the voices of birds that heralded the spring in America. Incidentally, Carson never called for a ban on chemicals. As a leading marine biologist, she argued against reductionism and favoured a holistic approach. Our aims here are more modest than hers. The small crew of scholars and practitioners here is drawn from different countries, disciplines and schools of thought. But they share with Carson a willingness to begin with the particular and draw links to the larger general insight in the long view of time.

We do hope the dialogue of ecology, the science of life and of history, the study of human pasts and presents will be productive. The structure and functions of nature in a simple material sense can no more be viewed in isolation from human actions. In turn, the latter increasingly hinge on not just how we achieve peace with one another but establish the lineament of a peace with nature.

GUNNEL CEDERLÖF and
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One blood

MICHAEL ADAMS

We be of one blood, ye and I
–Rudyard Kipling,
The Jungle Book

ABRUPT social and environmental change is usually explored in popular culture as apocalyptic, and increasingly framed around ideas of the Anthropocene in other current research. In this paper I explore these ideas in a long-term context, and bring together threads of recent thinking about conservation and biodiversity on one hand and social risk and preparedness on the other. Though based in Australia, I was born in India (the fifth generation of my family there), so my analysis touches on both countries.

It is often said that Australian Aboriginal people have the longest continuous cultural tradition on earth: there is around 50,000 years of archaeological evidence of Aboriginal presence. Human ancestral remains found in south eastern Australia dubbed

*This essay was inspired by many sources, including work by ecologists Richard Hobbs, Abi Vanak, Brad Purcell and Vidya Athreya; and social scientists Deborah Rose, Lesley Head, George Monbiot, Bill Gammage and Val Plumwood.

'Mungo Lady' and 'Mungo Man' are respectively the oldest known human cremation in the world and the oldest human remains in Australia: a ritual burial and an ancient presence. During the long period of Aboriginal occupation, the island continent transformed repeatedly. It dried out, became more flammable, and most of the megafauna became extinct. At the peak of the last glacial maximum 20,000 years ago the sea was 120 metres lower than now, and the coastline stabilized at current levels only 6,000 years ago. Aboriginal people occupied all Australian environments, with components of these landscapes continuing to evolve over this long time frame, most notably with the use of fire. Sophisticated and localized practices developed to enable human and non-human communities to flourish and sustain themselves.[1]

About 5,000 years ago, ancestors of Aboriginal people from South East Asia brought the dingo (*Canis lupus dingo* in Latin, and with many Aboriginal names) to Australia (this made wolves and their relatives the most widespread mammals on the planet). After the continent-wide establishment of the dingo, both the thylacine and the Tasmanian devil became extinct on the mainland, making the dingo the largest non-human terrestrial predator. Dingoes lived both as companion species to Aboriginal people and in free-ranging wild populations in all Australian habitats. Dingoes and mythological dingo-people ancestors have a prominent place in Aboriginal cosmologies.

When British colonizers arrived in 1788, they also brought companion dogs with them, part of a new group of species introduced to the country. The common suite of temperate Old World domestic and culturally associated animals began to spread across Australia, including cattle, sheep, goats, pigs, horses, dogs, cats, rats and mice, rabbits and foxes. But a colony founded on sheep pastoralism had very different attitudes to the presence of wild dogs, and worked to eliminate the dingo, building (and maintaining into the present) the longest fence on earth – the 5,400 kilometre dingo fence. Having extirpated the wolf in Britain 200 years previously, the colonizers commenced a campaign against dingoes that continues today. In many parts of Australia landholders are required by law to kill dingoes on their properties.

Outside of hunted species, the human-canine relationship is likely the oldest close animal relationship we have in our evolutionary history, and a complex one. The point of separation of 'dog' from its ancestor 'wolf' is extensively debated. Domestic dogs and wolves, dogs and dingoes, dogs and coyotes, wolves and coyotes, all can interbreed, reflecting the persistent failure of the species concept to establish a clear and accepted definition, and demonstrating the ongoing rationalist obsession with accuracy and order. Dogs are the world's most common mammal carnivore: there are possibly a billion dogs on the planet.

In a common paradox, the dingo is also classed as a native animal and, consequently, protected under environmental legislation in many places. Research over the last decade has consistently shown that dingoes as top predators play an important role in ecosystem processes, and in fact suppress the impacts of other introduced predators (such as cats and foxes) on biodiversity. In another paradox, there is strong evidence that poison-baiting programmes, commonly used to kill dingoes, actually increase levels of predation on domestic stock, by destroying pack social and age structures that would control hunting and dispersal behaviour by juveniles.

Dingoes today occupy a range of complex ecological and symbolic roles in Australia's social and environmental mosaic. Depending on tenure and legislation, they are: companion animals cared for in Aboriginal and settler human families; purebred wild native predators with keystone positions in maintaining healthy ecosystems; crossbred dangerous, destructive and wanton killers of sheep (and sometimes humans). A re-visioning of their place in Australian agricultural and bushland environments could result in simultaneous better outcomes for biodiversity and pastoralism, and a redefining of relationships with humans that does not have killing as the focus.[2]

Many of the animals brought by the colonizers have established free ranging populations, with most of these now being considered agricultural or conservation threats. Colonial and post-colonial presence is less than 0.5% of Australia's human history, but in that short window Australia has experienced the highest number of mammal extinctions of any country in modern times. The key causes of these extinctions are debated, and range through agricultural clearing, changed fire regimes, predation by introduced animals and persecution of dingoes. While these extinctions are on the one hand unusual, they also reflect the fact that globally most extinctions of recent times have occurred on isolated islands, of which Australia, though large, is one. A recent estimate suggests that while oceanic islands comprise 3% of the land area of the planet, they are where 90% of bird and reptile extinctions and 60% of mammal extinc-

1. B. Gammage, *The Biggest Estate on Earth: How Aborigines Made Australia*. Allen and Unwin, Sydney, 2011.

2. B. Purcell, *Dingo*. CSIRO Publishing, Canberra, 2010.

tions have occurred in the last 400 years.

But while it is true that 24 mammals have become extinct in Australia in the last 200 years, many new species have been successfully established, occupying the habitats of those extinct species and interacting with the new combinations of species and ecosystems. Australian ecologist Richard Hobbs has led thinking in this area of 'novel ecosystems'. There are probably more kangaroos in Australia now than before colonization (because of the provision of permanent water for stock); dingoes have interbred with domestic dogs since colonization; and our largest raptor, the wedge-tailed eagle, depends for survival in many places on rabbits. This is a much-debated issue, with one broad camp arguing that this is a conservation catastrophe, and another arguing that these 'no analogue ecosystems' and hybridizing populations are the new form of biological diversity, more fit to flourish in a climate-changing world.[3]

As the colonizers struggled to understand the new continent, the agricultural and pastoral project both expanded and contracted, and that pattern continues. Australia's climate is dominated by multi-year fluctuations rather than clear annual cycles. In 'good' years agriculture expanded, only to contract in response to subsequent drought. Urban expansion and conservation land uses have also replaced agriculture and pastoralism in many places. New assessments of climate change indicate that increased extreme weather events and increased extreme fire events are also reshaping Australian environments.

Globally, there is an old but increasing trend in agricultural abandonment (cessation of land use for agriculture), as well as land abandonment from humanitarian disasters with consequent depopulation. By 2015, there are many interactions between extinctions, introductions and hybridization, and agricultural abandonment and rewilding. In a changing environmental and social context, the outcomes of these continuing processes are emergent and unpredictable.

Returning to a human focus, indigenous Australians are now living in the post-apocalypse of colonization – massive death from genocide and disease; violent displacement from ancestral homelands; forced erasure of culture and language. The colonial impact in Australia not only violently displaced indigenous peoples but displaced the intellectual structures of the continent, structures that evolved with the Australian environment in all its age and variability. This colonial history underlies the persistent pathologies that now position Aboriginal people on the lowest socio-economic rung in modern Australia. That displacement and the rationalist colonial modes of thought also underlie the dramatic environmental transformation of the country: Aboriginal sacred practices of 'caring for country' were forcibly eliminated.

But parallel to that history of colonial devastation is a story of strength and resilience. People who are forced (or sometimes choose) to live on the margins have unique strengths.[4] Aboriginal people have in the deep past adapted to rapid and significant environmental changes, responses that were likely mirrored all over the world. The prevailing view has identified the paradox that while they may contribute the least to climate change, indigenous communities globally are amongst the most vulnerable to its impacts. Low socio-economic status, dependence on natural resources, residence in vulnerable geographic regions, and histories of inadequate policy response, all create increased vulnerabilities.

However, some cultural characteristics may mean that indigenous communities can be well placed to develop effective adaptive responses to climate threats, and indigenous knowledge systems may contribute significantly to understanding environmental change. Intimate and detailed knowledge of biophysical environments over long time frames means that changes are often observed and noted. Indigenous knowledge systems are typically adaptive, so responses such as adjusting times for carrying out traditional burning (in response to changed humidity and rainfall for example) are already occurring.

Extended kinship networks may generate significant social capital and broader exchange networks that can offset decreased access to appropriate food and other resources. The highly mobile nature of many indigenous families can increase possibilities for relocation due to, for example, extreme coastal weather events. Indigenous communities typically exist at the peripheries of government and civil support, both geographically and in policy terms. While this obviously increases some vulnerabilities, it also means that communities are often used to being self-sufficient and may respond more effectively to breakdowns in civil services.

While indigenous and local communities have particular cultural characteristics adapted to conditions of risk and uncertainty, modern and modernizing societies have quite different cultural characteristics that might

3. R. Hobbs, E. Higgs, and C. Hall, *Novel Ecosystems: Intervening in the New Ecological World Order*. Wiley Blackwell, 2013.

4. L. Head, M. Adams, H. V. McGregor and S. Toole, 'Climate Change and Australia', *Wiley Interdisciplinary Reviews: WIREs Climate Change* 5(2), 2014, pp. 175-197.

make them particularly vulnerable to rapid and unwanted change. These societies attempt to control change, to maintain stability, to impose a form of order that facilitates predictable outcomes. But these norms are surprisingly recent: only a couple of generations ago in developed world contexts, frugality, stoicism, preparedness for hardship were not only normal attitudes but celebrated as strengths. The massive rise of consumer capitalism, with its attendant foci on individualism, accumulation, and conspicuous excess and waste, is largely a post-World War II event. So modern societies now carry with them not only the technologies and knowledge for control, but also the forms of thought that make the assumption of control inevitable.

Madhav Gadgil wrote of the contrast in intellectual systems between tribal and small-scale local societies and industrial scale societies in 1998, which he differentiated as societies that see themselves and nature as a 'community of beings' versus those structured around 'dominion over nature'. Key aspects contrast egalitarian societies based on sharing and with deeply moral human-nature reciprocity, with hierarchical societies based on individual accumulation and amoral utilitarian resource management.

In India, with its long history of invasions and resettlements, many different systems of thought have developed and flourished. Conquerors famously converted, and India is so geographically complex that many societies persisted in all kinds of landscapes marginal to the conquering cultures. Intellectual systems that are structured around intimate knowledge and on respect and not control persisted. As in Australia, Adivasi (Scheduled Tribe) communities suffer many disadvantages but continue to hold unique knowledge traditions intimately linked to engagement with place.

While Australia is a continent with a small population of twenty five million with many extinctions, India has a very large population with almost no mammal extinctions. India covers 2.4% of the world's land area and houses 17% of the world's human population. It simultaneously contains 8% of the world's mammals and 12% of its birds, and is considered one of the world's biologically 'mega-diverse' countries. The persistence of those species and their habitats in the world's second most populous nation creates an extraordinary opportunity to understand cultural relationships with wildlife and ecosystems. India has a deep history of reverence for animals, with numerous animal *avatars* of gods, a wide range of animals respected as sacred, and extensive vernacular knowledge in Adivasi and other communities about animals and their habitats and behaviour.

Ecologist Vidya Athreya has coined the term 'tolerance habitat' to describe potential spaces of interaction between people and wildlife outside national parks.[5] Hers and other research has examined relationships with leopards, wolves and other large predators in Indian rural and urban environments. In many places where native predators hunt domestic animals, pastoralists consider this positive: the lost stock are offerings to the gods, and the consequent increased vigilance means better care. This idea of tolerance habitat describes places where there is a cultural disposition to sharing space with other species, even when doing so is inconvenient or even dangerous because, of course, convenience and safety are assumed conditions of modern societies. As in Australia, in contemporary India large predators and other animals occupy contradictory positions. The Wildlife Protection Act and the rise of the animal rights movement overlie ancient traditions of both reverence and interaction, including hunting, and distinctions between wild and domestic are less clear, and perhaps less relevant.

India has several wild canid species, including wolves, hyenas, jackals and dhole, and large village and urban dog populations. Free ranging dog populations function as: predators (of native species and sometimes human children); as carrion consumers (particularly after the abrupt decline in vultures); as prey for rising leopard populations near urban areas; as loved companion animals; and as diseased pariah packs of increasing concern to health and urban authorities. India has not had a focus on lethal control of problem species, and killing animals is often only done for food and other resources, whether through pastoral and farming activities, or Adivasi and other local hunting.

Acceptance of risk and uncertainty, including that posed by strange others, and being prepared culturally, physically and intellectually to respond to those risks, is both an ancient cultural capacity and a very necessary current one for our collective uncertain futures. As a geographer, I don't see evidence of abrupt social and environmental change as something structured temporally (that is, looming in the future), but structured spatially and socially. Aboriginal people recently lived through this, and for many individuals and societies all over the world, including both developed and developing nations, risk and uncertainty are part of daily life. It is affluent modern

5. V. Athreya, M. Odden, J. Linnell, J. Krishnaswamy and U. Karanth, 'Big Cats in our Backyards: Persistence of Large Carnivores in a Human Dominated Landscape in India', *PLoS ONE* 8(3), 2013.

communities who position apocalyptic change as being in the (distant) future.

Considering ecological and social histories through a lens that accentuates adaptation and capacity rather than pathology reveals different landscapes of hope. These are landscapes of hope not only for human societies but also for all the other beings with whom we share the planet. Acknowledging the potentials in ancient and vernacular knowledge systems, close ties to regional landscapes, and propensities to accept uncertainty and change as fundamentals of the everyday, might be the basis for recognition and revival of critical practical and cultural skills. The continuity of older, more environmentally and socially benign relationships between people, animals and landscapes holds potential for responding to unfolding uncertainty.

The skills and qualities necessary to creatively respond to unpredictable futures will need to embrace old tech and low tech, as well as new tech. Humans have historically demonstrated almost endless ingenuity, and we will need to have the imagination to uncover characteristics and knowledge we already possess, hidden in deep cultural pockets. In Australia we still essentially eat the foods brought by the colonizing First Fleet in 1788, despite living on a continent where Aboriginal people have long demonstrated that there are thousands of flourishing edible species.

Some ecologists write of 'landscapes of fear' in describing interactions between predators and prey and the influence this has on ecosystems. Much popular representation of abrupt social and environmental change also focuses on fear. For both of these situations, I think 'attention' is a better word, and a better idea. Fear can be an emotional response to perceived or anticipated danger or hurt, while attention is a mode of being alert to the context of ones surroundings in all their dimensions, from enabling to dangerous. Attention is to attend, a fundamental of spiritual or mindful practice. India, home to several world religions, nevertheless has strong secular traditions. Australia is home to the oldest cultural (and spiritual?) tradition on the planet, and also deeply secular. Time spent in village temples, time with indigenous communities, time with animals in changing landscapes, raise for me the importance of thinking and feeling beyond that secular. Attending closely when we encounter strange others – whether individuals, cultures or species – helps focus awareness of the larger dimensions of understanding our place in the world.

The global spatial inequities of the early 21st century demonstrate the extravagance of the developed world built on the depletion, suffering and frugality of other peoples and places. Abrupt and unwanted social transformations may invert that relationship: those who are not living on the edge may find they have taken up too much room, and those on the edge may discover that they are strongly positioned for creative responses.

Much current rationalist prediction of Earth futures under the rubric of the Anthropocene is deeply negative. Having the capacity to move beyond the limitations of rationality may be key to embracing positive uncertainty. Learning from cultures where change is normalized and acknowledged might help us move beyond ideas of grief and loss, and an obsession with control, to a cultural disposition towards attentiveness, care and respect. And extending those qualities to what Val Plumwood calls 'our Earth others' might re-engage us to accept our place in the cycles of life and death in which we are always, everywhere enmeshed.

History eats its young

SANDRA SWART

WHEN I was a child, the best thing at the Natural History Museum was the Japanese spider crab – the *takaashi-gani!* Huge, skeletal, an arm-span of four metres culminating in giant pincers, surely a maneater? Certainly utterly unnatural and deliciously alien – it shook me to my small, portly foundations. My brother and sister shared my awe. Our hot sticky hands would be pressed against its glass cage and our eyes turned up in wonder at its strangeness. To get there, my siblings and I would race through the hall of mundane African animals in their dusty khaki settings. Those animals were, in any case, much more impressive alive and in the flesh, a mere car drive up the coast in the game reserves of Zululand. Here in the museum they were prosaic creatures: utterly ordinary – quotidian and natural.

We would rush past a family of amiable lions, a roguish warthog and a rather disdainful pair of impala (who looked uncannily like the more judgemental of the Mitford sisters). These displays warranted only a passing glance on our way to the richly anticipated splendours of the Nipponese crustacean. But among them, almost unnoticed in the hall of beasts, was the Bushman diorama. If memory serves, it was a family scene depicting a timeless 'stone age' fireside. The figures were ostensibly life-size but very small people (almost our height, but gracile and slender; Elvish in comparison to our stocky little Hobbit bodies). I think the father figure may have freshly returned from the hunt; the mother was tending a fire and a child with equal gentle concentration. It has become elided in my mind with many such other scenes of the primitive 'Other'. In fact, I may be misremembering it a trifle (although even today, thirty years later, I could give you every detail of the spider crab).

Certainly in South Africa, Bushman dioramas figured in natural history museums even up to the 21st century, long after the end of Apartheid. The scenes were intended to show these indigenous people in their 'natural habitat' – the wild veld – performing their 'archetypal' lifestyles of hunting and gathering. For example, the South African Museum in Cape Town only closed its notorious Bushman diorama in 2001. The display was closed after four decades following protests by the Bushmen (or Khoisan or Khoe-San) community and other groups, who argued that the exhibit was a reminder of a past which saw Bushmen as part of natural (rather than human) history – as sophisticated animals or as extinct hominids from a hunting past, taxonomic remnants now only visible in reconstructed form, like dodos and dinosaurs.

A museum expert had originally cast the Bushmen figures in the first decades of the 20th century in the desert of the Northern Cape and South West Africa (now Namibia). His original project was to cast them for scientific study as examples of a 'pure' racial 'type' – which was part of anthropological efforts to construct a typology of races (usually on a hierarchy from primitive to advanced, with whites at the top of the pyramid). This became part of the triumphalist narrative of white conquest from Dutch settlers in the 17th century to the white government of the apartheid state.

However, short-term histories depicting whites as all-powerful are misguided. For example, at first contact between white settlers and the Khoisan in the mid-17th century, the local people had the upper hand. Settlement has too often been explained teleologically (from the present), as inevitable, almost preordained, because white settlers ended up controlling the country in the end. The early white settlers have been credited by the generations which followed them with a power they did not possess. Actually, the first intercultural encounters were not initially aggressive, nor were the white settlers dominant or formidable. Indeed, they were fairly impotent at first, helplessly reliant on indigenous people for two vital commodities – not only livestock but knowledge about how to keep the animals (and thus themselves) alive.[1]

This first contact was based on uneasy commerce and easy conflict, with both sides grabbing opportunities. Some indigenous Khoisan actually accumulated cattle and became rich and influential. Moreover, there was a great deal of internal conflict within what may be crudely called 'racial' groups – between indigenous groups (and between white authorities and white settlers) rather than a straightforward white-black or settler-local conflict. Who knows how the conflict might have played out if the Dutch settlers had not received unexpected help from a fellow traveller, a secret settler which arrived in a bundle of dirty linen from a passing Dutch fleet: smallpox.

The scourge that erupted in 1713 was devastating: the urban slaves died first, followed by many of the white inhabitants. When the epidemic escaped into the hinterland, it became evident that the Khoikhoi had the least immunity to it. A year after the disease first struck, as many as 90% had died in some clans and the strongest clans collapsed. But this had nothing to do with white settler power or sophistication. Long-term histories help invert the triumphalist white narrative of conquest.

After a campaign of genocide against the surviving Bushmen by whites from the 18th century (ostensibly because of their depredations on livestock but really because of settler encroachment into their territory – to sketch the history in its simplest terms), Bushmen started to be depicted from the 20th century as childlike, benign, non-threatening, the 'gentle people', 'the harmless people' or as people living 'in harmony with nature'.[2] The label 'primitive' was replaced with 'ancient' and the label 'unsophisticated' was exchanged for 'unspoiled'. Romantic neo-Rousseaus saw them as Noble Savages, unsullied by modernity and its discontents. Hippies saw them as the original flower children. They were valourized as non-violent and peaceful. Others saw them in Jungian terms, as a window into the human psyche.

The Bushmen's so-called 'timelessness' and purported 'antiquity' precipitated several ironies. They were studied by western scientists during the Cold War as a 'futurist' case study of how humanity might develop post-apocalyptically if the nuclear bomb were dropped. From the 1980s, they came to be seen as genetic archive, who can reveal something about 'our past' or about 'our evolution' – as though they had themselves failed to evolve as other human groups did, but just remained stuck in the solidified amber of time: like the paleo-mosquito in *Jurassic Park*, which retained the 65 million year old blood in its body. Thus the Bushmen have been viewed as literally ahistorical – as though somehow living outside history itself.

Historians have shown how the endorsement of such pseudoscientific and ahistorical narratives had a 'disastrous impact' on those categorized as 'Bushmen'.[3] In fact, contrary to the

1. For a useful parallel to a related colonial context, see Heather Goodall and Allison Cadzow, *Rivers and Resilience: Aboriginal People on Sydney's Georges River*. University of New South Wales Press, 2009; see especially chapters 1 and 2.

2. The labels used to describe indigenous groups are hotly contested. 'Khoikhoi' was used to refer to pastoralists and San or 'Bushmen' to hunter-gatherers. Then historians realized there was a lot more crossover and a very porous boundary between the two groups. Some prefer Khoisan as a collective name, a term amalgamating Khoi and San/Bushmen. 'Bushman' is sometimes seen as derogatory, but at other times it is embraced as empowering. 'San' is sometimes used, but it is more accurate (although not always expedient, as in this article) to distinguish between diverse populations and to describe the individuated history of such groups in different areas within southern Africa. For a discussion of the nomenclature, see Shula Marks, 'Khoisan Resistance to the Dutch in the 17th and 18th Centuries', *Journal of African History*, vol. 13, 1972, pp. 55-80.

3. E. Wilmsen, *Land Filled with Flies: A Political Economy of the Kalahari*. University of Chicago Press,1989; Robert Gordon, *The Bushman Myth: The Making of a Namibian Underclass*. Westview Press, 1992.

myths, by the mid-20th century the majority of Bushmen were an almost unnoticed rural proletariat, surviving as a labour force on white-owned farms. Researchers claimed they had discovered 'pristine' Bushmen in the Botswana-Namibia border area, an isolated and static vestige of the Stone Age managing to survive as all human ancestors had lived 10,000 years ago, as hunter-gatherers. But what the researchers failed to understand was they actually owned their own livestock or worked for African farmers. Hunting and gathering was not their 'archetypal' existence but a fall-back position when jobs were few or the cattle grew sick. Archaeological investigation has since shown that has been unevenly but enduringly the case for 2000 years. Also ignored was a long history of commerce with whites, which declined only in the early 20th century, when borders were closed and was further exacerbated by the economic depression from the 1930s.

The case study of Bushmen is only one of a plethora we could use to illustrate the dangerous folly of short-termism in understanding Africa. Of course, it is hazardous to generalize about Africa; at 30 million sq km, it covers 20% of the world's total land area and, with a billion people, it is the second most populous continent. It has over 50 countries (depending how one recognizes some sovereignties). Misunderstanding history is a crucial part of creating such nations – and a fundamental part of politics. But, up until recently, simply demonstrating that Africa *had* a history was politically important. Almost two centuries ago, in the 1830s, Georg Hegel claimed that: 'At this point we leave Africa, not to mention it again. For it is no historical part of the World: it has no movement and development to exhibit … What we properly understand by Africa, is the Unhistorical, Undeveloped Spirit, still involved in the conditions of mere nature, and which had to be presented here only as on the threshold of the World's History.'

One hundred and thirty years after Hegel, his words were echoed by Hugh Trevor-Roper, Regius Professor of Modern History at Oxford University, who announced in 1963: 'Undergraduates, seduced, as always, by the changing breath of journalistic fashion, demand that they should be taught the history of black Africa. Perhaps, in the future, there will be some African history to teach. But at present there is none, or very little: there is only the history of the Europeans in Africa. The rest is largely darkness... [a]nd darkness is not a subject for history… Then indeed we may neglect our own history and amuse ourselves with the unrewarding gyrations of barbarous tribes in picturesque but irrelevant corners of the globe: tribes whose chief function in history, in my opinion, is to show to the present an image of the past from which, by history, it has escaped…'

Africanist historians struggled in the heady 1960s to prove the condescending Oxbridge professor wrong (and not the least show him, as Africanist historian Basil Davidson once said, that in the 13th century 'the scholarship of Timbuktu and Djenne could probably have given points to that of Oxford and Cambridge'.) But, after a brief florescence of studies into the African *longue durée*, the deep past started attracting less scholarly interest; there is an 'historical foreshortening', with the 20th century getting the attention.[4] (Even the term 'pre-colonial' is political and normative; it is akin to the term 'non-white' in apartheid South Africa. Both illustrate the labelling of the 'other' where the second part of the label is the important part and the prefix 'pre' or 'non' merely defines the entity as not the *real* object of interest or value).

In the 1950s and '60s, it was the deep past impelling interest in Africa. In the first years following independence, pride in at least having a pre-colonial past was key in building the new self-assurance of independent states, while pride in a 'glorious' past was critical in more crudely nationalist discourse. Some of the shift to short-termism was purely practical: when the colonial archives opened up in the 1970s and '80s, they offered a tantalizing and previously unmined seam of sources, which historiographical gold diggers could not refuse. Another practical reason is that fieldwork (to obtain oral histories) became much more difficult in Africa in terms of both personal safety and funding.

A more ideological reason, offered by the rise of the corporate university, is that presentism is ostensibly much more 'relevant' than the long-term – and so much more fundable. (I have, for example, been repeatedly told to describe my own research as 'socio-environmental sustainability' rather than 'animal sensitive history'.) There is also the practical matter of increased specialization within academia – I call it 'death by sub-discipline'. Historians and archaeologists and historical linguists no longer talk to each other. (After all, lexicostatistics and stratigraphy terrify normal historians, and 'dendrochronology' and 'glottochronology' tend to scare off non-specialists.) It is difficult to keep up with the required advances in one's own, let alone cognate disciplines. But long-term understandings of the past are key in understanding the present.

4. Richard Reid, 'Past and Presentism: The "Precolonial" and the Foreshortening of African History', *The Journal of African History* 52, 2011, pp. 135-155.

Analyses of the deep past which rely solely on European documentation only add to a short-term and static snapshot view. Methodology matters. When historians talk approvingly of the long-term, they inevitably mention the Annales School which insisted on long-term social history, urging us to study human history within an ecological framework, while rightly attacking environmental determinism. In fact, it was Lucien Febvre, who co-founded the Annales line of thinking, who warned that people with less complicated technologies were not more 'shaped' by their environments. (A lesson those misrepresenting the Bushmen might have heeded.)

In Africa, there are several methodologies one could deploy to attain these aims: oral tradition is a key approach (which should not be confused with oral history). Oral tradition is cultural material communicated between generations and thus surviving over long periods of time (whether in speech, song, folktales, idioms, jokes and proverbs). In this way, it is possible for a people to transmit history and other knowledge without a writing system.

There are many paths to understanding the long history of Bushmen groups, for example. Earlier pasts are written in the rock art still visible in the mountain caves of the Cederberg and Drakensberg, are sung and recited in oral tradition, still heard in the click sounds of present-day indigenous languages and remain audible in the whispering of bones and blood. Clearly archaeology, oral tradition, historical linguistics and DNA analysis are vital in understanding shifting population density and distribution, the changing material culture of hunter-gatherer and pastoral economies and evidence of commerce, exploring their contact with Nguni-speakers and ending forever the myth of Bushman seclusion, simplicity or stagnation.

Human beings change environments significantly while themselves adapting to shifting ecosystems, but they have done so for thousands of years (or indeed millions if we are willing be generous with the label 'human'): long before the Neolithic revolution. Environmental history – indeed, all history – needs a long-term view. An important corrective offered is to destroy the myth that past environments were 'pristine' (a myth not unrelated to the myth of the prelapsarian 'harmlessness' of indigenous peoples like the Bushmen, which casts them in a Disneyesque 'Lion King' version of the past but also denies them both agency and the possibility of their own histories).

Twenty years ago already, Fairhead and Leach showed the perils of short-term narratives with long-term consequences. They revealed that social scientists believed in a Malthusian degradation of the commons precipitated by an explosion of African populations.[5] These social scientists blamed decaying traditional authority, increased mobility and individuated farming for destroying natural resources. Development theorists sometimes blamed the colonial past, but more often successive African governments from the time of Sékou Touré onwards. Theorists from a nationalist perspective looked instead to a pre-colonial past to find a 'good society' in harmony with nature. But for both parties, deforestation was recent and accelerating. Deforestation symbolized decay – political, social and environmental. Trees were good, no trees bad. A forested past became a 'moral past'.

5. James Fairhead and Melissa Leach, *Misreading the African Landscape: Society and Ecology in a Forest-Savanna Mosaic*. Cambridge University Press, 1996.

Fairhead and Leach used a case study from Guinea to challenge this normative framework. They said that these social scientists had missed the wood for the trees: they had fundamentally misunderstood the history of vegetation in the area. So, the duo picked an area called Kissidougou: they conducted oral history interviews, collected evidence from oral tradition, archival material from French military occupiers in the 1890s, they found aerial photographs from the 1950s and trawled through early traveller accounts from the 1780s to 1860s. What they uncovered was startling. They found that the vegetation was actually relatively stable and that the grasslands were becoming more wooded in certain areas. Moreover, the early traveller accounts suggested very little forest cover.

Quite aside from humans destroying trees, it quickly became clear that the villagers were responsible for establishing forest islands around their settlements. Local land use had actually enhanced the forest in some places. Villagers created the wooded islands by accident (for example, by harvesting grass and cattle-tethering which reduced combustible grasslands) and deliberately (by actively cultivating trees to create shade, wood and places to conduct social rites). Leach and Fairhead also discovered that quite aside from the Malthusian dystopia of relentless population expansion, in some rural places the human population had actually decreased from higher figures in the early 19th century, as a result of late 19th century wars. Thus the previous short-term analysis had inadvertently supported the antithesis of the long-term truth.

The basic premise on which the previous Malthusian 'deforestation narrative' was based was fundamentally ahistorical. It also betrayed an

old-fashioned understanding of both anthropology and ecology. It was premised on the notion that once African vegetation was original and pristine, therefore, all subsequent change is degradation. It posits that African society was once static and in harmony with nature. It simply sees the pre-colonial past as Eden and the post-modernity as apocalyptic. Modernity and mobility are the culprits. This is a highly romantic view of ecology and of human society, predicated on a short-term view which sees 'modernity' as a thing that showed up with the white colonizers and ignores change in the long pre-colonial period.

Newer thinking in ecology, however, suggests that Africa has had long-term climate fluctuations and the history of its vegetation is one of continual transition. (In fact, we now know that in the last millennium, Africa has experienced a much drier climate than today in the Medieval Warm period, 1000-1270 AD, and a wet climate in the Little Ice Age, 1270 to 1850 AD, which was itself punctuated by three arid periods). So, just as social science now accepts that people can no longer be thought of as 'pure types' (like the Bushmen 'specimens' collected by the museum expert as examples of archetype), regions do not have 'original' or 'archetypal' vegetation. It is always in transition, shaped by the historical constellation of current ecology, past climate variability, earlier vegetation paths and human society.

It is thus clear that which vegetative forms are desirable at any one time is a human choice, but not made within environmental conditions of their own choosing. To paraphrase Karl Marx in a very different context: Humans make their own environment, but 'they do not make it as they please; they do not make it under self-selected circumstances, but under circumstances existing already, given and transmitted from the past.'

Matching the deforestation narrative, with its overarching moral implication and Malthusian underbelly, was the 'desertification' narrative. We were told that the Sahara's sand dunes were shifting unstoppably southwards across the Sahel, blustering over abandoned farms and rendering once fertile fields into wasteland – eventually destined to kill all life on the planet. This became part of global crisis rhetoric in the 1980s and even trickled down to my primary school. As a small child, I was shown so many films and given so many lessons about the 'deserts on the march' that I started keeping a stern eye on the school sandpit.

But this image is a mirage. The myth of desertification was constructed in the French colonial period when the colonial authorities blamed local pastoralists for desertification of what they imagined had once been a forested land. It proved a useful myth in Algeria and Tunisia, mobilized to justify colonial occupation and the criminalization of African land use in the Maghreb. Recent studies have demonstrated that the vegetation cover within the Sahelian zone varies yearly dependent on rainfall. No irreversible change is evident in the desert boundary of the Sahel over long periods of time. Of course, localized land degradation occurs in various areas, but desertification is not the crisis the United Nations and my well meaning primary school teachers foretold. Quite the reverse, there is evidence to suggest increased greenery, across all vegetation types, globally.

Other studies expose how meaningless it is to look only at droughts from the 1980s if one wants to see material change over time. In fact, it offers climate change denialists the opportunity to insinuate that one is crying wolf. A long-term study of two centuries of climate change (which used rainfall records and proxy data from bodies of water like lakes and rivers) showed that rainfall levels had fallen, especially in the semi-arid areas of West Africa.[6] Although the temperature has not changed much, the whole continent seems to be experiencing increased aridity. So it is not that the rainfall depletion in the last generation is unprecedented (it also happened in the first years of the 19th century) and the recent droughts are not 'proof' of irreversible climate change. Thus the long-term history makes the story of human impact on the climate and environment rather more complicated than it is typically portrayed.

My own encounter with the danger of the short-term occurred in 1997 as a student at Oxford University, home for the holidays but restless to see my own continent with fresh eyes. I compelled my best friend, Adrian Ryan to join me in driving from Durban to Kimberley, where a demobilization camp had been set up for the Bushmen who had once served in the apartheid military during their illicit war in northern Namibia.

After Namibia's independence seven years earlier, members of the 31 Battalion (the so-called Bushman Battalion) consisting of Xun and Khwe and their families were relocated to South Africa. It was a tent-and-tin town on the edge of the desert. Some of the men had found work as security guards, but most were unemployed, living on meagre handouts from a new African nationalist government who regarded them as erstwhile enemies – as former collaborators with the apartheid state.

6. Sharon Nicholson, 'Climatic and Environmental Change in Africa During the Last Two Centuries', *Climate Research* 17, 2001, pp. 123-144.

Poverty was endemic. Promises made by the new defence force were broken. A strange illness stalked the children. A local game reserve owner had offered some of them work as living as exhibits alongside the wildlife. A few families went to take up the job offer of essentially 'being Bushmen'. But they returned almost at once, fired for not being prepared to live outside in the veld and dress in skins and worst of all, having church services and a strong hankering for television. They failed at being authentic enough. The evidence of policy short-termism was everywhere. The long-term and the short-term were colliding in a dangerous situation.

It was then that an incident occurred which reminded me that there is an astute awareness among some Bushmen of their supposed identity as an 'ancient people', who simultaneously and ironically are 'without history'. It was very salient reminder that many Bushmen are all too conscious of this short-term imposition of ersatz long-termism, and sardonic about the recent need to invent themselves as ancient. A well meaning American anthropologist was conducting ethnographic interviews in the camp at the same time. She wandered up and joined us. Adrian and I were chatting to an old Bushman, clad in the tattered remnants of an army uniform, who was drinking a beer under a thorn tree. Perhaps to break the ice, she remarked that she had recently come from Johannesburg.

'Ah,' said the old man in response, 'I hear it is a city of gold! I hear that a man may walk two moons – and see both come and go – before he gets there…' When the anthropologist turned the other way, the old man smiled to himself. He winked at me, before whispering: 'But I can make it in six hours in my *bakkie*.'[7]

7. *Bakkie* is a pick-up truck.

A cattle country

ANNELI EKBLOM

MOZAMBIQUE imports close to 90% of its meat requirements in urban areas from other countries, an enigmatic fact considering that Mozambique is, as I will argue here, a cattle country. The 'solution' advocated by many experts is industrialized cattle production and high yield (non-traditional African) breeds. Such ideas and plans lack basic ecological and historical understanding of the thriving cattle production that does exist in many parts of Mozambique today. Traditional cattle keeping is in many ways ecologically well suited to meet the environmental constraints of episodic disease and droughts. It is also an enterprise that is low in imposing environmental costs. The cattle usually roam freely over large distances and grazing is low intensity and crucial for landscape openness and biodiversity.

A long-term history of cattle illustrates the intricate relationship between people, cattle and landscapes and the ecological skills of farmers and herders. This stands in contrast to the generally poor reputation of African swidden farmers and herders in the literature on development and ecology, automatically and with scant critical analysis associated with the process of environmental degradation. I believe that one reason for this association is

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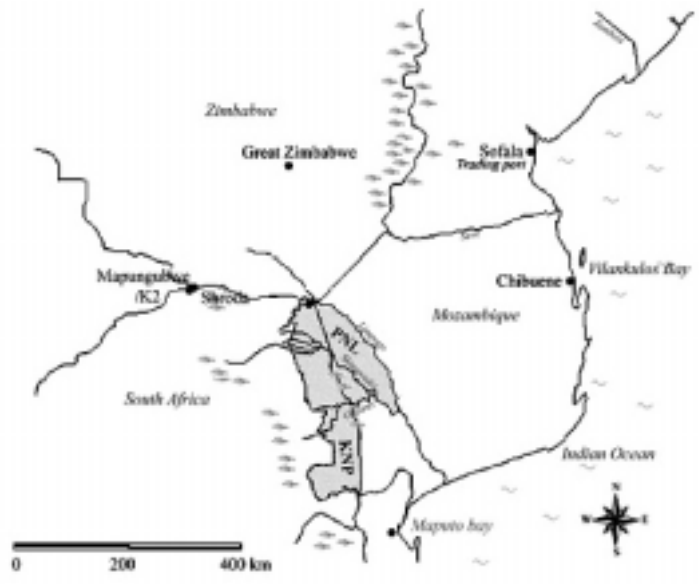
simply that there is a general lack of knowledge of long-term environmental history which also has serious implications for landscape management and conservation.

Existing traditional African cattle breeds are hybridized ones with traits that strongly favour resistance to disease and periodic droughts. They are now in danger of becoming extinct through substitution of higher yielding, but less resistant, breeds. The historical ecology of domestic cattle in Africa began c. 10,000 years back. As reviewed by Boivin et al., it is now believed that cattle (*Bosafricanus*) were first domesticated in North Africa and then spread south of the Sahara. The indigenous species were later interbred with taurine cattle (*Bostaurinus*) from Southwest Asia. Through the Indian Ocean trade, African breeds have also been intermixed with Indian breeds of humped Zebu cattle (*Bosindicus*), possibly by the early second millennium of the Common Era (CE).

One reason for the present low market sale of cattle from rural areas in Mozambique must be sought within the social fabric of cattle keeping in the country. Though farming communities have been quick to respond to new demand from both Indian Ocean trade merchants (including both Arab and later Indian traders) and also European markets, written sources point to great difficulties in obtaining provisions. Cattle were often imported from the islands of Comores and Madagascar to the Portuguese trading stations utilizing existing trade networks between India, Persia and the East African coast. These imports should not be seen as an indication that indigenous cattle were actually in short supply, but rather that there was unwillingness among farmers to use cattle for market sale.

To understand why, we need to look more closely at the long-term history of cattle keeping. The Mozambique landscape is dominated by savannas, which are marked by high rainfall variability and episodic droughts. Throughout history, and particularly in comparison to Europe and Asia, Mozambique, as other parts of Africa, has had a relatively low population. The introduction of cattle took place c. 2000 years back and with this followed a gradual change in the social fabric within and between communities living in southern Africa. In farming villages, cattle enclosures (*kraals*) were placed at the centre of the settlements, and living quarters, storage bins and ceremonial areas were arranged around the kraals. The layout of settlements reflected a society where descent was counted on the male side, with bride wealth and a social organization based on lineage. The build-up of cattle herds by certain individuals also marked the beginning of accumulation of wealth, accompanied by alliances and trade with the Indian Ocean.[1]



Near the Shashi-Limpopo confluence there is a sequence of sites showing increasing centralization and political control. Around 1050 AD, there was a spatial reorganization and the cattle kraal was shifted from the centre of the settlements. This reorganization was linked to a change from communal ownership of cattle to an individualized one, interlinked to an increasing social and political control by cattle owning individuals. From this time on cattle also came to symbolize and manifest power, as displayed in Mapungubwe and also later centres such as Great Zimbabwe on the Zimbabwe plateau, where a strong division exists between elites and commoners.[2]

Written sources from the 16th century give us a better understanding of the social fabric of society. At the household level, cattle constituted bride wealth and as such served to symbolize contractual alliances between families. Thus the head of the family who controlled the cattle also controlled the future of his sons, and thereby the lineage. Only a son with

1. Glass beads from the Indian Ocean trade began to appear in the entire region of southern Africa from the 8th century CE.

2. These centres are Shroda (*c*. AD 900-1020), K2 (*c*. AD1020-1220) and Mapungubwe (AD 1220-1300). Great Zimbabwe (1050-1450 AD) rose to power as Mapungubwe was abandoned. See T.N. Huffman, 2008.

many cattle could start his own village and found a lineage. Since women were the farmers, a man with many wives was considered rich. Cattle, meanwhile, were the domain of men. Villages were arranged as chiefdoms under a lineage head, and these chiefdoms were typically small. The larger and more powerful polities amalgamated smaller political entities through marriage alliances and cattle, and payment of tribute involving agricultural produce or labour. For families and individual men with no networks or social alliances, the logic of affiliating with a strong ruler was thus tied to the access of cattle and bride wealth.

But how did domestic cattle affect the physical landscape? It has been speculated that the grassland-forest mosaic found in the coastal lowlands of southern Africa today was a result of the initial clearings made by the first farmers. However, pollen analysis from both the coast of northern South Africa (Natal) and southern Mozambique suggest a mosaic of forests, grasslands and savannas before the onset of farming. My own studies around the archaeological site of Chibuene in the Vilankulos region show that despite evidence of the use of fire and presence of both cattle and cereal, there are no causal links to a decline in forest cover. A reduction of forests did indeed take place sometime between 1200 and 1400 CE, but this coincided with several prolonged drought events as a result of global cooling of the Little Ice Age. The drivers of change were the larger shifts in climate patterns, not resource abuse or use by cattle keepers.[3] The decline of forests can also be seen in the Natal coast in South Africa. Neuman et al. prefer to trace this phenomenon to the intensification of cattle herding associated with the formation of the Nguni ethnic group and a specialization in herding.

Whatever the reasons for the decline of the forest, the processes of climate crises and specialization in cattle herding may well have been interlinked, as cattle provide economic security against climatic vulnerability. In the interior low rainfall regions, herders are likely to have settled along the permanent rivers. The presence of possible cereal grain, charcoal and dung fungi in a pollen diagram from lower Limpopo valley, shows that farmers were living here from c. 800 CE. Though the riverine forest vegetation was highly variable over time, it seems to have responded more to climate/hydrological variability than to densities of herbivory or changes in fire intensity.

It is likely that early herders utilized the existing mosaic landscapes for grazing cattle and for opening fields. Thus, there is no reason for us to expect a dramatic conversion of landscapes with the onset of pastoralism. Late Stone Age communities probably used fire as a tool to create good grazing areas for wild animals, a practice that was continued by the emerging farming communities. Fire and grazing by both wild and domestic animals contributed to keep grazing areas open in the landscape, important for the ecology of the landscape as discussed. Thus, domestic cattle filled similar ecological niches as wild cattle, as did other herbivores with similar food patterns.

The centres of political power that were emerging in the early second millennium were aggregating not just people but also large cattle herds. Mapungubwe is believed to have supported close to 5000 inhabitants at its peak, and Great Zimbabwe 10,000 inhabitants or more. The geographical location of these power centres tended to shift on a centennial scale, but even so the allocation of land for fields, grazing, collection of wood and for wild animals and spirits must have been a matter of continuous negotiation. It has been speculated that both these centres were abandoned due to environmental crises and/or degradation. Unfortunately, in the absence of detailed vegetation histories for these centres, it is impossible to confirm or refute this hypothesis. However, it has also been suggested that cattle was grazed in the larger regions around these political centres and that herds may also have been allocated to smaller allied centres.

The droughts associated with the Little Ice Age were particularly severe in the 18th and 19th century. The period was also marked by social and political turmoil with military campaigns and resulting migrations associated with the expansion of Nguni armies in the whole of southern and eastern Africa. Cattle raiding, which is frequently mentioned in the written sources, as also wholesale killing of cattle, was used as a political tool. In the early 19th century the Nguni chief, Shoshongane, established the Gaza state in southern Mozambique, resulting in a superstructure of Nguni aristocracy being imposed on the former political units. But the Gaza state experienced several disputes over succession. This resulted in internal wars and local farmers and smaller chiefdoms being raided for cattle. By the end of the 19th century, cattle herds in southern Mozambique were severely diminished due to a combination of centuries of political unrest, repeated cattle raids and killing of cattle and recurring droughts.

Partly because of a lack of cattle, young men in southern Mozambique trekked to South Africa to save money for bride wealth. There was also a switch from cattle to other sources of

3. The onset of this climatic period in southern Africa is debatable, but it lasted until c. 1850 AD.

bride wealth, which led to severe inflation. An 18th century source reports that bride wealth was 5-10 cows and today, as personally observed in Limpopo National Park (PNL), bride wealth is closer to 10 cows.[4] Thus cattle value seems to have been rather stable over the centuries despite large variations in its availability. The ethnographer Junod quotes informants that in the period 1840-1870, bride wealth had begun to be paid in iron hoes, the price increasing steadily from 10 to 50 hoes. After migrant labour began, bride price was also paid in pound sterling. Whereas one pound was initially equivalent to ten hoes, prices soon rose so that ten hoes were equivalent to £18-20. And though lineage chiefs attempted to stabilize bride wealth prices, agreeing on a set price of £8 for 10 hoes, they were ultimately unsuccessful.[5]

Cattle owners in Africa must have a good ecological knowledge not just of the specifics of their breeds but also about the ecology of its natural enemies as has been summarized by Spinage. The 16th century Portuguese written sources report sudden and inexplicable death of cattle and horses, but did not at that time relate these to animal disease. Tse-tse (carrier of the organisms that causes sleeping sickness disease which affects vertebrate animals, including humans) and related diseases are first mentioned by name in 19th century sources when infected areas were also mapped. But, the boundaries of these areas shifted over time. Travellers also pointed out that local herders and hunters knew how to stay clear of infested areas and to protect livestock from disease. This in part had to do with the resistance of local cattle breeds, but also a good knowledge of the ecology of tse-tse.

It was a rule to keep the savanna landscape open through fire and to avoid shrub encroachments on grazing lands and abandoned fields. For instance, when Umzila, Shoshongane's son and successor, moved his capital from south to central Mozambique in 1861, he also brought along his cattle (many of which had been confiscated from the south). The area had been depopulated due to political unrest, and Umzila found that shrub had encroached on former grazing lands that were now infested. He, therefore, ordered a massive clearing and killing of wildlife to eradicate the tse-tse.[6]

Another example of the delicate ecology of animal disease is the spread of the rinderpest epidemic (a viral plague that also affected both wild and domesticated cattle) in 1896. The combination of the wholesale decline of cattle in many areas and large reduction of wildlife that had taken place in the 18th and 19th century, mostly as a result of sport and professional hunting for the market, had caused an encroachment of the bush that in turn facilitated the spread of the rinderpest with disastrous effects on both cattle and wildlife.

The history of animal disease teaches us that there is a fine balance between bush encroachment, wildlife, animal disease, drought and cattle – all of which affect each other. This balance has a bearing on both landscape management and conservation today. Even though recent research challenges or nuances degradation narratives, African landscapes, and by association traditional practices that have produced them, continue to be uncritically classified as environmentally degraded. This is shown, not the least, in the discourse around CDM or REDD forests where plantations are introduced and farmers dislocated on the basis that the area is degraded, often without any prior environmental assessment.[7] Similarly, and related to this issue, conservation areas have experienced an enduring conflict with cattle herders because of a fear of disease spreading between wild and domestic animals. But, the history of animal disease also shows the vital importance of herders and farmer's management of the landscape to mitigate its spread. This is particularly important in conservation areas where animal densities are too low to keep the landscape open.

The history of cattle indicates that despite variations in numbers due to disease, drought and confiscation of cattle, farmers have managed to replenish their herds relatively quickly, assisted partly by long distance and trans-oceanic trade in cattle. Still, even in very rich cattle countries, there is no official market for selling cattle. The stability of cattle prices in relation to other currencies of bride wealth suggests that the 'cattle economy' is governed by an entirely different logic. The social role of cattle may be one reason. But, cattle are also the most

4. André Fernandes (1560) describes the Lobola value for a wife as being worth that of a cow (in G.M. Theal 1964, vol II, p. 143) and a later account from a Mr Penwell (undated but probably 18th century, in Theal 1964, vol II, p. 460ff) states how marriages are carried out as barter, sometimes with the price of 5, 10 or more cows.

5. Junod 1927, vol I, 275-6.

6. Swynnerton 1921, in Spinage 2012. p. 897.

7. CDM stands for Clean Development Mechanism and REDD Reducing Deforestation and Forest Degradation. These programmes are part of the Kyoto protocol. Governments in the northern hemisphere or private organizations companies allocate, as part of the carbon offset programmes, money to governments, businesses, and landowners in the southern hemisphere to reduce the carbon emissions associated with deforestation or environmental degradation. This money can either go to the preservation of native forests or to plant forests of fast growing trees such as eucalyptus, the latter being most common in Africa.

important source of security and investment opportunity for farmers.

In livelihood surveys carried out by my colleagues and me in Limpopo National Park, most households reported that they kept cattle for security and for marriage. Other surveys, also conducted in Limpopo National Park, viz. by Milgroom, show that sale of livestock was the preferred solution in times of scarcity. Most households, when asked, replied that they preferred to invest surplus money in cattle. In fact, the economic assets of many households today, when counting numbers and prices of cattle, are much higher than reported in official statistics.

However, the problem of many households is that cattle are 'dead capital', to use the phrase of the economist Hernando De Soto. There are no/few official markets; grazing rights are typically afforded through customary rights not legal ownership of land, and banks do not permit cattle as security for loans (also few households have accounts).[8] Paradoxically, this fact may account for the stability of cattle prices, even as the potential of farmers' skills of rearing cattle in Mozambique and of the strength of local economies and enterprise goes unrealized.

The intricacies of what I would term the 'ecology of cattle' must be better understood before embarking on far-reaching recommendations of how cattle production is to be designed in the future. This knowledge is important not just for policymakers, development planners, and landscape managers but also for local farmers, both for biodiversity and conservation, as discussed above, but also for development planning.

States and development organizations alike tend to have a paternalistic attitude towards local farmers, which sometimes effectively blocks local initiatives. The historical ecology of cattle shows that local farmers have the capacity to respond to new demands on the basis of their own needs and wants. Thus, any new initiative in cattle production must be driven and organized by local enterprise.

8. Other problems that cattle herders in rural areas face today are poor infrastructure for inoculations, which means that farmers are not allowed to sell cattle on official markets, the inaccessibility of markets and cattle theft, a serious problem for farmers living in populous areas. (Personal communication with informants living in Limpopo National Park.)

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Fluid landscapes

RAVI AGARWAL

'The hills of Delhi, though not attractive in themselves, give a pleasant view across the Jamuna, and in clear weather allow, it is said, even a glimpse of the Himalayas'[1]

A line of sight linking of Delhi to the Himalayas, more than 300 kms away is fanciful, but metaphorically apt. For here, a glacier gives rise to the mighty river Yamuna, the largest tributary of the Ganga. A lifeline of the city of Delhi, it serves the water needs of its 17 million inhabitants. As it flows through, it forms a cusp along with the Ridge. Today, it also forms part of Delhi's boundary between the adjoining state of Uttar Pradesh while entering the city from another state, Haryana. Early lithographs show the river as a quiet water-front, flanked by the massive 17th century Mughal Red Fort, dotted with a few people and some boats. It is a far cry from the dense view one sees today.

The Himalayas, where several major rivers originate, were formed by the intercontinental collision of the Asian and Indian plates.[2] The massive Indo-Gangetic basin, and its Yamuna sub-basin, evolved during the Miocene period, which gave rise to the water carrying paleochannel through the modern Indian states of Himachal Pradesh, Uttar Pradesh, Haryana and Rajasthan. The Yamuna finds extensive mention in the *Rig Veda* (1700 to 1100 BC), and in folklore relating to the Hindu god Krishna.[3] It is believed that the ancient city of Indraprastha (app. 1400 BC) was built on its banks (the site of the Old Fort in Delhi). Successive human settlements came up (up to 17th century AD) along the river bank in Delhi, or around the extensive hydrological network formed by the river. Water security continued to be key, and the currently in-use Western Yamuna Canal, was built by Firoz Shah Tughlaq (14th century) and later extended to Delhi by the Mogul emperor Shah Jahan in the 17th century. Several historic monuments that

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* www.toxicslink.org and raviagarwal.com

1. For a detailed account of the 'hills', the other defining natural feature of Delhi, see Ravi Agarwal, 'Fight for a Forest, the Delhi Ridge', in Mahesh Rangarajan, M. D. Madhusudan, Ghazala Shahabuddin, *Nature without Borders*. Orient Blackswan, New Delhi, 2014 and a previous version in *Seminar* 613, September 2010. *A Gazetteer of Delhi 1912.* (p. 2). Reprinted by Vintage Books, Haryana, 1992.

2. For a detailed account see, Inder Bir Singh, 'Geological Evolution of the Gabga Plain – An Overview', *Journal of the Paleontological Society of India*, Vol. 41, 1996, pp 99-137. (Accessed at http://www.palaeontological society.in/vol41/v13.pdf on 25 June 2015.)

3. In Hindu mythology, Yamuna is the sister of Yama – the god of death, and the daughter of Surya – the sun god. The river waters represent Yamuna's tears, as she cries when her brother is banished to the underworld.

were built along the riverbank, now exist close by, as the meandering river has shifted course several times.[4] The Yamuna has been part of Delhi's history for well over a millennia, though it is only in the last fifty years that it has been transformed so drastically. Despite its romantic historic and temporal landscapes, the river's most contentious narrative is currently in the process of being written.

Today the modern megapolis dumps more than 3.8 million litres of mostly untreated sewage every day into the river. The city accounts for more than 80% of the total pollution load of the entire length of the river. Also, its freshwater flow here is often not more than a trickle as competing demands of industry, energy, drinking water and agriculture, leave little left over for a flow, and in many places the river is dry during the summer months. Besides, climate change signals greater likelihood of glacial meltdowns and erratic monsoons in the near future. Meanwhile, developers encircle the exposed flood plains, eager to grab the land, awaiting in a vulture like fashion the river's final demise. Not surprisingly, the stinking, dirty, dying river is best avoided by the people of Delhi. The degradation of such a major natural feature raises fundamental questions about the future of the natural features our cities. Is the script pre-written in the model of urbanization?

The change has been fast, accelerating as the city becomes 'global'. As recently as the 1970s, the river still existed as a natural feature. Birdwatchers bore witness to this, as it was common to visit sites like Wazirabad, the Tibetan market, ITO bridge, or the Okhla barrage for an early morning nature outing. Records show even rare species like the now locally extinct Siberian Crane, on the 300 sq km Najafgarh *jheel*, which was drained in the 1960s.[5] Most of these sites have now either been drastically concretized or turned into fly-ash dumps. The marshes and stretches of tall grass are gone, replaced by a city skyline, along with flyovers, tarred roads and dark polluted waters.

How 'functionally' nature is treated is apparent from the way the landscape of the river is divided. Till the point where Delhi's waterworks are located, the river has no major drains, the water seems normal, and the countryside is rural. Right after the waterworks, the river becomes a black mess of sewage. A hypothetical walk along the 52 km distance the river traverses the city – from Palla village to Jaitpur – reveals social and ecological narratives in transformation. From Palla, for about 22 kms downstream, the river still flows through a semi-rural countryside. One can see vegetables, fodder and flowers being cultivated by villagers living in the adjoining villages like Jagatpur, Hiranki and Mohamaddpur. At Hiranki, for example, acres of yellow marigold fields present a stunning view. The village's inhabitants are from Punjab, and claim to have been there for over two hundred years.[6]

Near Mohamaddpur, buffaloes bathe in the river below newly made high-tension interstate transmission lines, which span across the river. Children can be found swimming everywhere. One can see *puja* being performed in small temples along the riverfront. There are fishermen, who live on their large thatch covered wooden boats. They are seasonal migrants from Bihar, licensed to fish, a practice initiated by the British.

This instability of the landscape is obvious. In fact, the changing riverfront is a microcosm of similar changes taking place in many other urban centres across India. Already the rural areas are being transformed. Near Jagatpur, one sees hectic bulldozer activity to create a biodiversity park by the Delhi Development Authority (DDA). The village of Jagatpur, going by the rows of brick and mortar multistorey housing being developed, can no longer be called a village in the traditional sense. It is possessed by the pulse of the approaching city, and its residents are no longer farmers but have jobs in the city. Cars and motorcycles dot the small road on the embankment flanking the river. Their relationship to the river is already lost here; it is considered a nuisance.

The transformation is complete at the Wazirabad barrage. It is also where the main waterworks of Delhi and the nerve centre of its water supply is located. On the other side of the Wazaribad barrage the river stops being one; it marks the beginning of the urbanized city. The river waters are replaced by sewage from the massive Najafgarh canal, which deposits the untreated filth of the residents of West Delhi into the dying river. From here till Jaitpur, about 30 km away, continuing the walk is virtually impossible. The banks are intercepted by fences, *nullahs*, private boundaries, government structures, bazaars, cremation grounds, temples and gurdwaras, bridges, parks and some agricultural activity (which is still alive in the later sections, but not for long). In a flash, one can see a dark urbanization overtake a natural ecology that sees the

4. See A.K. Grover and P.L. Bakliwal, 'A Study of a Section of Yamuna River through Remote Sensing: River Migration and the Floods', in Upinder Singh (ed.), *Delhi: An Ancient History*. Social Science Press, New Delhi, 2006.

5. See Usha Ganguli , *A Guide to the Birds of the Delhi Area*. ICAR, Delhi 1975.

6. Ravi Agarwal, Have you Seen the Flowers on the River? Khoj, New Delhi, 2009 (accessed at www.raviagarwal.com on 18 July 2015).

river only as a repository of waste and sewage.

The river was not always as functionally restricted as it today. It had interwoven ecological, cultural and economic ties to the city. Water bodies and water channels (many now lost) abounded in the city, and connected it to the river. The hilly ridge and the river formed a complex water system fed by monsoon run-offs. Jheels – small and large – marshes, canals and nullahs, not only served as waterholes for animals but also provided water security to people. The canals were storm water drains, which carried monsoon run-offs, but also provided the flooded river a way to backflow its excess waters to reduce the pressure on its banks. The green lined nullahs have now become sewage canals and subsequently covered as concrete pathways and roads to contain the stink. It is only recently that the courts, on the basis of citizens' petitions, put a halt to such practices.

The economic ties to the city are also changing. For example, marigold flowers were sold in Chandni Chowk, the historic wholesale market square in Old Delhi. Unfortunately, the two hundred year old flower market has been shifted to a distant, hard to access, new location at the Ghazipur landfill site. Ironically, the city in its attempts to 'beautify' has also lost a bit of its colour! It has lost culturally as well. Though the river remains a site for festivals and rituals, these are now restricted to a few spots. Pollution caused by large-scale idol immersions and pooja offerings is a concern, and some areas are being earmarked for such practices.

There is a need to question the ecological value of such changes. Should the river be reduced to a mere 'aesthetic' view rather than seen as reflecting an integrated idea of human-nature coexistence? For example, while the flower growers have an economically sustainable lifestyle, those living at Jagatpur at best 'tolerate' the river. The co-dependent relationship with nature has been lost. As evident from the shifting of the flower market, and the gradually transforming landscape of the riverfront, the city itself is being gentrified and increasingly becoming an 'aesthetic' project rather than a living space for all.

At the heart of an ongoing civil society struggle (Yamuna Jive Abhiyan) for over a decade has been a fight for the river to be recognized as an ecological space and not merely a water channel.[7] Land use is key to the ecological functions it can perform. While an ecological space is based on the idea of coexistence that recognizes the value of nature, should the river merely be seen as a water channel, it would then be imagined to perform only a hydrological function. Such a technological view of ecology has unfortunately been institutionalized. Various institutions of the city, which control the river, claim it as either land or water. For example, all the land is owned and controlled by the Delhi Development Authority (DDA), while the Flood and Irrigation Department controls water flows. Neither is invested in the idea of a wetland or flood plains, which can be both water and land. This sharp divide between land and water, does not value the ongoing biological, hydrological and cultural interactions, which take place on the flood plains.

The concretization of the flood plains, and its channelization are of great ecological concern. Of late, Delhi has been slated to be transformed into a 'world class' city, and mega projects are being proposed.[8] Even though the river and its flood plains are designated as zone 'O' in the DDA's master plans (where construction activity is not permitted), yet these zones are often changed without due process, and in secrecy.[9] The Akshardham temple as well as the Commonwealth Games Village, constructed in the middle of the flood plains in central Delhi, are two examples where the riverfront has been violated, and huge construction allowed by creating new embankments.

In fact, the Commonwealth Games drastically changed the larger topography of the river front. A new highway was constructed parallel to the river adjoining the old Yamuna Bridge which cordoned off a large chunk of the flood plains, effectively releasing more land for development. New metro stations and buildings have come up, and a temporary millennium bus depot built for the Commonwealth Games, has refused to shift out despite court orders. In hydrological terms, studies show that the flood plains can recharge up to 70% (600-900 million cubic meters) of the city's annual water needs.[10] If the river is channelized or the flood plains built upon, this water will be permanently lost. Such understanding is new and not a part of institutional plans. Efforts to channelize the river first came to light in the 1970s, but

7. Yamuna Jive Abhiyan is a civil society group campaigning to save the river. For more details see http://www.peaceinst.org/publication/book-let/YJA%20-%20MOU.pdf (accessed on 10 June 2015)

8. Alexander Follmann, 'Ultra Mega Projects for a World-Class Riverfront – The Interplay of Informality, Flexibility and Exceptionality Along the Yamuna River in Delhi, India', *Habitat International* 30, 2014, Elsiver, pp. 1-10.

9. See, Restoration and Conservation of River Yamuna. Final Report of the Expert Committee submitted to National Green Tribunal, New Delhi, September 2013.

10. V. Soni, A.K. Gosain et. al, 'A New Scheme for Large-Scale Natural Water Storage in the Floodplains: The Delhi Yamuna Floodplains as a Case Study', *Current Science* 96(10), 25 May 2009.

are still in play. Despite a recent ruling in a public interest litigation,[11] in which the National Green Tribunal (NGT) prohibited fresh construction in the 9700 ha flood plains, the issue is far from settled, simply because it is so deep rooted, and the price of land has increased astronomically.

The question of the extent of freedom a natural feature like the Yamuna river can be allowed to have in a city, remains. However, the models resorted to are almost always those of European rivers like the Thames, Elbe or the Rhine, which flow in temperate climates through different topographies and are not monsoon dependent. The river in Delhi has, for example, a very minimalist gradient (0.4 m over a 50 km stretch), is comparatively shallow and hence prone to flooding over a large area. One response has been to make more barrages and water diversion canals to control the flow, rather the work with the natural flow of the river, even though these cannot be used during heavy rains.

Channelization was resorted to control rivers like the Rhine in the early 19th century to serve as single bed rivers (eliminating tributaries) for transport and commerce.[12] However, it is a misconception that the issue of channelization has been settled in Europe. There too the ills of such restrictions are under debate, since it has led to loss of biodiversity and created waterlogging on the other side of embankments. In some places rivers are being freed of these encumbrances, and allowed to flow free once more. Such models are important to learn from, but can hardly be copied blindly. Considering that even our urban planning is borrowed from European cities, it seems that we need to be more responsive to local urban economic transformations, ecology and culture before we decide upon appropriate interventions.

Channelization is often used as a flood control measure. Decadal floods linked to heavy monsoon rains in the upper reaches of the Yamuna have caused river waters to enter the city in the past. Backflows up the nullahs have also flooded people's homes far inland, despite embankments built along the river bank. Routinely they displace the poor who live on the banks of the river, and flood agricultural fields. In effect, the embankments are already a channelization of the riverbed, albeit to safeguard the city from floods. This is only partially effective as it does not solve the problem of waterlogging on the other side of the embankments and nullahs.

The issue of river pollution has used up resources and occupied policy makers, media as well as the courts. The fact that the river is very polluted has been established beyond doubt by every independent and government report. In fact, post Wazirabad, the river is visibly black, though it could contain invisible toxic chemicals and heavy metals even before.[13] The colour of the river has become a rallying point for action, mostly leading to technology based solutions. However, the technologies installed to solve this problem have not worked. For example, the 23 sewage treatment plants are either not operating or working well below capacity. Even if they were, much of the city is unconnected by sewer lines; sewage just flows freely into nallahs and the river. Over 1500 billion rupees have been spent in the various Yamuna Action Plans over the past decade, but the river remains dirtier than ever. Currently plans are afoot to construct a parallel diversion canal (interceptor canal) along the entire length of the river to trap all sewerage flowing in at a cost of over 25 billion rupees.

However, even the Central Pollution Control Board (CPCB) has acknowledged that this will not solve the problem.[14] It needs to be recognized that the problem of pollution is linked not only to sewerage infrastructure but to how water is used in the city and in agriculture. Measures like reducing waste water, ensuring local treatment before it is discharged in drains, recycling it, improving crop irrigation efficiency, measures to reduce sewage by using low water use toilets, and so on are critical. Most importantly, an adequate amount of fresh water needs to flow in the river in all seasons. The last requirement is a bone of contention, which no one seems willing to take head on.

What should an adequate water flow in the river be is a key question. Some of the terms used to define it are 'minimum', 'environmental', and 'ecological' flows. Such a flow determines not only the limits to water which can be extracted from the river, but also if the river can be dammed per se. Already, many stretches of the river bed are dry in the summer months, since water is diverted for irrigation, industrial and drinking water purposes. The river then becomes a stinking, crawling drain of only slush and sewage

11. See final order of the National Green Tribunal (NGT), issued in January 2015 on a case filed by Manoj Mishra and others for the Yamuna (accessed at http://www.peaceinst.org/projects/activities/NGT%20Judgement%20on%20Yamuna%20Case.pdf on 11 July 2015).

12. For a detailed account see, Mark Cioc, *The Rhine, An Eco-biography, 1815-2000.* University of Washington Press, Seattle, 2002.

13. 'Toxicity Load of Yamuna River in Delhi', Toxics Link, New Delhi, December 2014.

14. See Centre for Science and Environment (CSE), 'Review of the Interceptor Plan for the Yamuna', CSE, Delhi, May 2009 (accessed http://www.cseindia.org/userfiles/CSE_interceptor_analysis.pdf, on 10 June 2015).

water. The NGT has recently appointed an expert committee to determine this flow.[15] However, given that past directives of even the Supreme Court which mandated a 10 cumecs (cubic meters per second) minimum flow have been ignored, the ecologist's plea for a 70-80 cumecs flow seems far-fetched, even if sorely needed.[16] Some policy persons and technologists consider any water flowing from rivers into the oceans is 'wasted' and this negates the idea of the river per se or the water cycle they constitute.

Unfortunately, in all these dynamics, it is only the poor who have borne the brunt of any measure. From the viewpoint of those who made the waterfront their home, it has been all bad news. Yamuna Pushta, a colony of over 40,000 people (many living in brick houses), with functional health centres, schools and even a police station was brutally mowed down in a matter of weeks in 2004. The final nail in the coffin was an order of the Delhi High Court attributing the pollution in the river to these (and such) occupants. This was rightfully criticized as 'bourgeois' environmentalism.[17] A similar fate met other colonies. The old *dhobi* ghats below the Yamuna bridge, as well as the wastepickers disappeared, and were replaced by new roads and parks. The erstwhile Yamuna Pushta was ironically renamed 'DDA Golden Jubilee Park', and is today a large horticulture lawn with cultivated flowers and manicured lawns. The DDA has proposed a new riverfront development there, unmindful of the fact that the area is under water annually.

At the time of writing this article, the court has stopped all agricultural activity on the riverfront, especially for vegetables, as they were found to be contaminated by the toxic waters. The Delhi Development Authority has begun the process of eviction of an estimated 30,000 people.[18] Once again, it seems that no matter who causes the problem, its impact is borne by the most vulnerable. It brings home the fact that the idea of ecology is a deeply political one, and for it to be democratic and equitable, it needs to be examined from a ground up perspective.

River systems such as the Yamuna encompass planetary as well as human time scales. Historical accounts are, of course, relatively recent and in the case of the Yamuna, less than one thousand years old. Within this, it is only approximately over the past 50 years that more detailed socio-political accounts have become available showing an accelerated human impact on the river. Recent studies indicate that the Himalayan glaciers which feed the Yamuna and similar rivers could melt over the next 600-700 years, significantly reducing future water availability.

The European experience, documented from the early 19th century onward, reveals an ecologically destructive industrial-urban approach towards river systems. Even though of late there have been attempts to recover the biodiversity of rivers like the Rhine, it may already be too late. It appears that in a very short 'moment', the ecology of rivers has been systematically destroyed. Ecological models for the future need to seek other trajectories than the mere economic-technological approaches currently being suggested. They also need to, besides implementing immediate actions such as clean ups, incorporate longer time frames. This is necessary for understanding natural bodies such as rivers that have a planetary significance and follow another temporality.

The future of the river or similar natural bodies possibly lies in redefining a larger nature-human ecological relationship, which is not merely a 'functional' one. Nature as a resource, or as a geography to be conquered or even as a landscape to be admired, have been some driving ideas of our dominant relationship with it.[19] The complex web of life that rivers are part of needs to be better understood and possibly redefined as a collective between 'humans and non-humans'.[20] Rivers cannot be treated merely as a flood nuisance or used for dumping sewage. In practical terms, rivers should be allowed to flow freely, with adequate water and land, and without being excessively controlled. In many ways, rivers are like living entities to be respected as part of a fundamental cycle of water and life on the planet. If this is not done, it may well result in yet another form of self-inflicted violence, all in the name of a sustainable future. Ultimately, if allowed, rivers can exist without us, but can we?

15. See final order of the National Green Tribunal (NGT), fn 6. The NGT has also formed a committee headed by the Secretary, Ministry of Water Resources, Govt. of India to make recommendation on the issue of water flow.

16. Himanshu Thakkar, Ensuring Environmental Flows in Indian Rivers. Blog at sandrp.worldpress.com (accessed at https://sandrp.wordpress.com/2015/03/22/ensuring-environmental-flows-in-indian-rivers/ on 8 June 2015); also see V. Soni, S. Shekhar, et al., 'Environmental Flow for the Yamuna River in Delhi as an Example of Monsoon Rivers in India', *Current Science* 106(4), 25 February 2014.

17. Amita Baviskar, 'What the Eye Does Not See: The Yamuna in the Imagination of Delhi', *Economic and Political Weekly* 56, 10 December 2011.

18. Various news reports. For example see, 'DDA Bulldozes Farmers' Fields, Huts', *The Times of India*, New Delhi, 17 June 2015 (accessed at http://timesofindia.indiatimes.com/city/delhi/DDA-bulldozes-farmers-fields-huts/articleshow/47698279.cms, on 18 June 2015.

19. David Biggs, *Quagmire*. University of Washington Press, Seattle, 2010.

20. See Bruno Latour. *Politics of Nature*. Havard University Press. Cambridge, 2004.

Wild beasts in the city

HARINI NAGENDRA

WITH India on a seemingly unstoppable fast track to urbanization, cities and towns are expanding across the country. The growing urban footprint extends across vast expanses of countryside and forests populated by a rich diversity of wildlife. Many Indian cities deal with challenges of frequent incursions of wildlife. National parks such as Bannerghatta National Park at the southern periphery of Bengaluru, Sanjay Gandhi National Park in the northern part of Mumbai, and Van Vihar National Park in the heart of Bhopal, pose problematic challenges for wildlife conservation. Yet, the challenge of dealing with human-wildlife interactions in the urban context rarely, if ever, figures in considerations of urban planning in India and across much of Asia. Dealing with megafauna remains a challenge in the populated landscapes of South Asia. In the main, this discussion is centred on the rural and the forest, spaces that are increasingly shrinking as the city enlarges its footprint on the rest of the country.

We often forget that urban wildlife has played a major role in the imagination of nature in South Asian settlements over centuries. Such issues are common across many emerging economies and deserve careful scrutiny and attention before irreversible changes overwhelm landscapes. An examination of narratives of wildlife in and around Bengaluru provides a fascinating account of the changing ways in which encounters with wildlife have been framed, appreciated, and sought to be managed as settlements have formed and grown into towns, cities and metropolises. Given its global linkages in a networked age, its recent past as an industrial town and its long history of human settlement, it also provides a fine instance of a multilayered yet ever changing history.

Archival sources allow us insights into human-wildlife relations related to human settlements in the past millennium. Epigraphic inscriptions found on hero stones, pillars, rocks and temple foundations around Bengaluru provide some of the earliest available accounts of encounters with wildlife in this southern megapolis. It is an interesting fact that most epigraphical inscriptions that describe wildlife hunts and encounters with wild beasts have been found in the area around Kanakapura, at the southern periphery of the city. Formerly called Kankanahalli, this region continues to be well known as a wildlife habitat today, containing the Bannerghatta National Park.

Epigraphia Carnatica[1] describes an inscription from 1120 CE

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1. B.L. Rice, *Epigraphica Carnatica*, Volume IX: Inscriptions in the Bangalore District. Mysore Government Central Press, Bangalore, India, 1905.

(Kn 85) discovered in the village of Hagadur, recording the death of Augandan from an attack by a tiger while on a hunt. The inscription is careful to note that while the tiger attacked Augandan, he in turn pierced and killed the tiger before his own death. That is, Augandan died a victorious hero, not a vanquished nonentity. In the village of Levarahalli, an inscription from 1310 CE (Kn 11) narrates the death of Sokka-Illingatton and his dog from an attack by a wild boar, again stressing the fact that the boar was pierced by Sokka-Ilingatton before he died. Other deaths were less provoked. In 1351 CE, in the village of Muralebekuppa, Vira-Somaji was killed by a tiger while tending cattle (Kn 40), while at Budikuppe, Devappa was mauled by a tiger in 1653 CE (Kn 96).

The topography of the city influenced the location of wildlife attacks. Kanakapura is located in a dry deciduous forest landscape, where archival records describe a largely pastoralist existence, in comparison to settlements in more fertile, flatter areas such as Begur, where settlements were dependent on irrigated agriculture. Early rulers such as Hiriya Kempe Gowda, the founder of the medieval city of Bengaluru in 1537, recognized the importance of wildlife in providing a barricade of natural protection to his growing dominions. The local historian Fazlul Hasan remarks that Kempe Gowda, having annexed the regions of Shivaganga and Domlur, protected the landscape between these settlements. He 'allowed the forest to grow thicker since it provided a natural barrier and thus gave protection to its principality.'[2]

Rulers of the Bengaluru realms two centuries later also favoured a relationship to wildlife. However, it was no longer treated as a safety zone against intruders. Hyder Ali and Tipu Sultan, who governed Bengaluru during most of the 18th century, actively kept captive wildlife as a sign of royal prestige. Monsieur M. Maistre de La Tour, a French officer in Hyder's army, described Hyder as owning a number of tame 'spotted tigers' (presumably leopards). If his stories are to be believed, Hyder fed sweets to these beasts with his own hand.

As part of his daily routine, '[i]f he has leisure, he appears at a balcony, and receives the salute of his elephants that are led before him, as well as his horses. His tigers of chace likewise pay him a visit. They are led by hand, and are covered with a mantle of green and gold hanging to the ground, and a bonnet on their head, of cloth embroidered with gold, with which their eyes can be immediately covered, if they should chance to prove mischievous. Hyder himself gives each of them a ball of sweetmeats, which they take very adroitly with their paws, being exceedingly tame. These are the spotted tigers, and their keepers lead them every day into those places where the greatest crowds are: but the grand tiger, or tiger royal, has never been tamed by any attempts yet made.'[3]

Further accounts by de la Tour described Hyder's hunts in detail. 'When he is obliged to remain a month in camp, or in any town, he usually goes to the chace twice a week. He hunts the stag, the roebuck, the antelope, and the tiger. When notice arrives that this last animal has been observed to quit the forests, and appear in the plains, he mounts his horse, followed by all his Abyssinians, his spear-men on foot, and almost all the nobility armed with spears and bucklers. The traces of the beast being found, the hunters surround his hiding place, and contract the circle by degrees. As soon as the creature, who is usually hid in some rice ground, perceives his enemies, he roars, and looks every where to find a place of escape; and when he prepares to spring on some one to force a passage, he is attacked by Hyder himself, to whom the honour of giving the first stroke is yielded, and in which he seldom fails. Thus the pleasures of the sovereign are varied to infinity.'[4]

What is interesting about these narratives is that they portray a great deal of knowledge about the ecology and behaviour of wild beasts, including the fact that the covering of the eyes disorients leopards and makes them easier to handle. It also demonstrates the knowledge that tigers in settled landscapes move seasonally between the uphill forests and agricultural villages in the plains, depending on the availability of water and easy prey. This knowledge was strategically deployed to tame and hunt wild beasts.

Tipu Sultan, the 'Tiger of Mysore', allegedly used captive tigers to maintain discipline in his army. As described by a British captive James Scurry,
'Tipoo, thinking his mode of punishment towards those poor creatures who happened to fall under his displeasure not severe or terrific enough, ordered nine large tiger cages to be made, and placed opposite his kerconah, or treasury. They were arranged there according to his order, and soon tenanted, each with a large tiger.
'After the death of Colonel Bailey, we were paraded before these ferocious animals, and had an opportunity of

2. M.F. Hasan, *Bangalore Through the Centuries: A Historical Narrative of Bangalore*. Historical Publications, Bangalore, 1970 (first edition), p. 13.

3. Monsieur M. Maistre de La Tour, *The History of Hyder Shah, Alias Hyder Ali Khan Bahadur: or, New Memoirs Concerning the East Indies With Historical Notes*. J. Johnson, London, 1784, pp. 18-19; reprinted and published by Sanders, Cones & Co., Calcutta, 1948.

4. Ibid., p. 28.

seeing them fed once or twice a day; one of the nine was as black as a coal, the only one I ever saw of that colour. They were all taken in the Curakee jungles, which abound with elephants, tigers, wild boars, panthers, tiger-cats, leopards, & c., and lie about twenty miles from Patam, and about ten from Mysore. Those tigers, above stated, were designed for the punishment of high crimes and misdemeanours: three of his principal officers, namely, his head inchewalla, or general postmaster, his buxey, or paymaster general, and another, were severally thrown to the tigers, and devoured in an instant, all but their heads; for which purpose the tigers were always kept hungry! These all suffered within the short space of four months.

'Confinement, however, soon proved destructive to the animals themselves, as scarcely one of them survived above eleven months. At this period, there was a regular import of wild beasts at least twice a week, taken from the jungles by himself, on his hunting excursions.'[5]

Accounts such as these demonstrate the ecological knowledge of the hunters and animal keepers. Animals with rare colouring such as the black tiger described by Scurry above, or Immambucies, a massive 15-foot elephant of docile temperament belonging to Tipu's court, who was 'much caressed', were especially prized. Royal battles were staged between tigers and elephants, and tigers and wild boars, as described by a Portuguese member of Hyder's army, Captain Eloy Jose Correa Peixoto.[6] Thus, overall, the hunting, taming, and deployment of tamed wild beasts in court was a strategic act, seemingly for entertainment, but in reality as an important sign of kingly prowess and prestige.

Perhaps the most grotesque of the encounters between people and wildlife came from the influence of the Indian ruler's fascination with *shikar* (hunting) on the British elite. The accounts of hunting among the Europeans appear immediately after the defeat of Tipu Sultan in 1799, when the British East India Company had conquered the Mysore State. The British officers' disingenuous efforts to recreate the shikar very often led to the farce of urban 'hunts', a favourite pastime among the elite in Bengaluru. These hunts were usually conducted by British officers on horseback, armed with guns and spears, against tigers and other wild cats brought in cages from the forests surrounding Bengaluru, to be 'hunted' after being let loose in the urban backdrop of Bengaluru's Race Course. In this, the new urban elite was influenced by Indian royalty's use of the hunt to demonstrate bravery and prowess. Yet, the urban hunt in actuality demonstrated neither of these supposedly masculine virtues.

In 1811, a vivid account by a British officer, Colonel James Welsh described the hunting of tigers on the urban premises of the Bengaluru Race Course. The reinstated Maharaja of Mysore, making up for a dull audience with him the previous day, 'sent us a fine royal tiger to be hunted on the race course. Mr. Cole, always the leader, speared him four times, though scarcely drawing blood: after which Lieutenant Aubrey pinned him to the ground, the pike entering the loose skin of his jowl while he lay crouching under a small paddy bank; Captain Pepper struck him next, and provoked him to rise and wrench the first spear out; he then staggered a short distance, and took to a small tank, where several spears were flung at him, and one thrown by Pepper pierced his ribs, and actually drowned him. Mr. Cole, being well mounted, and a capital spear-man, was the only person who, for a long time, dared to face him; and, weakened as he was, it was no easy job to destroy him. A small rough dog belonging to Lieutenant Mercer never quitted the tiger till he was drowned, when a Sepoy volunteered to dive and bring him out, and actually did so.

'The next day a couple of royal tigers were sent, when Mr. Cole killed the first single-handed, though a large and active one. The second, being a more knowing brute, immediately gave chase to Major Russel, of our cavalry, who was nearly overtaken by him, when two black men ran in his way, one of whom he killed with a single bite, and then retreated under the new race stand. Into this place a woman and child had crept for safety, and as he came in at one end, and laid hold of her cloth, she wisely left it with him, and retreated with her infant uninjured. As we could not contrive to lure him out again, I pistolled him; by breaking his back, and then dismounting, we killed him with our spears. Whilst we were undecided, however, as to his back being fairly broken, he seized a square stone lying in front of him and actually broke several of his teeth upon it.

'I shall not give any further notice of this, our favourite amusement at Bangalore, but remark only that the panthers, though smaller, were always fiercer and more active than the royal tigers and generally gave better sport… Only one European was ever badly wounded in these sports; and we thus established the long contested fact, that tigers might be speared by men on horseback.'[7]

5. J. Scurry, *The Captivity, Sufferings, and Escape of James Scurry, Who Was Detained a Prisoner During Ten Years, in the Dominions of Hyder Ali and Tippoo Saib*. Henry Fisher, London, 1824, pp. 109-110.

6. E.J.C. Peixoto (1770). Memoirs of Hyder Ally From the Year 1758 to 1770 by Eloy Joze Correa Peixoto, in Annual Report of the Mysore Archaeological Department, Government Press, Bangalore, 1938, pp. 82-119.

These and other equally detailed and gruesome accounts by Welsh, describe hunts where Indian residents – even unarmed women and children – were in danger, but Europeans were generally untouched. British officers spearing tigers at a safe distance on horseback, armed with guns, and using peons on foot to do most of the dirty work of spearing and weakening the tiger.

Prey did not only come neatly boxed in cages. When the Prince of Wales visited Bengaluru, the Maharaja of Mysore prepared a royal hunt by having a large area of forest surrounded, into which tigers were driven and then fed well, in preparation for the eventual kill. The practice of the hunt continued well into the 20th century. The Bangalore Hunt, conducted annually from 1924 until the 1940s, was attended by European and Anglo-Indian participants, as well as members of the Mysore royal family. The impact on the surrounding countryside must have been severe, as Janaki Nair notes, with hounds and horses trampling over grasslands and fertile agricultural fields reckless of the damage caused to local residents.[8]

For the Indian residents, the dangers of wildlife were severe as the city grew, leading to an intensive period of targeted kills. During an 18 month period in 1835-1836, 2397 cattle and 14 humans were killed by wildlife, with an additional nine people wounded in the division of Bengaluru. One elephant, 22 tigers, 55 cheetahs, 21 leopards and one bear were destroyed during the same time. In 1836, rewards were instated for the destruction of wild predators, after which their number greatly decreased.[9]

Today, about two centuries later, the extermination of wildlife has been spectacularly successful. With the exception of Bannerghatta Tiger Reserve, tigers are not to be found in Bengaluru (although, as evidence of how far urban life is from that of mega fauna, I have heard a child of about 12 wonder if tigers lurk in an exotic eucalyptus plantation adjacent to a road choked with traffic!). Some types of wildlife are harder to confine to boundaries, like elephants, for instance. A few months ago, several schools at the eastern periphery of the city near Sarjapur were closed for a couple of days while a herd of elephants moved through the surroundings, trampling over tennis courts and damaging lawns at one school. And as further evidence of the urban detachment from wildlife realities, newspaper accounts described groups of urban gawkers converging in large groups and shining flashlights at the herd, further disorienting them and rendering it difficult for them to return to their familiar forest habitat.

Other wildlife invasions of urban habitats have been noted in recent times as success stories. The return of the lesser flamingos to Mumbai's busy port harbour was much easier to handle than the challenges of dealing with a herd of marauding elephants in Bengaluru. Stories of such animal-human conflicts are on the rise across India, as the city continues its seemingly relentless advance into the countryside. The herd that visited Bengaluru sadly killed four people in the rural areas surrounding the city during their brief excursion.

Hunting wildlife, as exercised by Indian rulers, was an act of symbolic importance. Use of captive wildlife was a strategic act, inspiring fear and awe, and underlining the bravery, military prowess and valour of the Indian ruler's administration. While engaging in hunts, or training captured leopards for use in their courts, Hyder Ali and Tipu Sultan were following in the footsteps of the Mughal rulers of the past.[10] The British colonial regime took this practice one step further, engaging in travesties of a faux hunt of tigers captured in cages from local forests and released on the Bengaluru Race Course, at a safe distance while mounted on horseback, and armed with spears and guns. Such hunts were an integral part of the practice of global imperialism across European colonies in the tropics, shaped by a conception of dominance over wildlife as a manifestation of imperial power.[11]

The roots of the current conflicts between Indian cities and urban wildlife incursions may lie deep in this history, influencing our framing of the wild beast as the 'other': a being to be valorized in battle, conquered in a hunt, trapped in a cage, butchered for trophies, and exoticized in print, but not capable of coexisting with humans. In smart cities of the future, we expect to have high-speed digital highways where we can browse for photographs of tigers and elephants, and watch spectacular youtube videos of wildlife at a safe distance. Yet, can we see the real thing? Unless we seek out a different imagination of coexistence with nature – on her terms, as much as on ours – there is little hope for the maintenance of urban nature in an increasingly urban planet.

7. J. Welsh, *Military Reminiscences; Extracted From a Journal of Nearly Forty Years' Active Service in the East Indies*. Vol. II. Smith, Elder and Co., Cornhill, London, 1830, pp. 5-6.

8. J. Nair, *The Promise of the Metropolis: Bangalore's Twentieth Century*. Oxford University Press, New Delhi, 2005, p. 59.

9. Charles Irving Smith, A Statistical Report on the Mysore. 1854, p. 24.

10. M. Rangarajan, *India's Wildlife History: An Introduction*. Permanent Black, New Delhi, 2001.

11. J.M. MacKenzie, *The Empire of Nature: Hunting, Conservation and British Imperialism*. Manchester University Press, Manchester, 1988.

Israel's threatened biodiversity

ALON TAL

THE *Bible* is replete with references to wildlife: After generic descriptions of the biodiversity in the Garden of Eden and then on Noah's Ark, the narrative focuses on the Land of Israel itself. The Bible metaphorically speaks of a 'Land of Milk and Honey'. But zoologists with evolved taxonomical inclinations would more aptly call it a land of mammals, reptiles, birds and amphibians. From asses and antelopes to vipers and vultures; from bears and bees to wolves, worms and wild goats – the scriptures literally teem with life. Samson combats lions while Daniel calms them down. Botanists could refer to the dozens of plants and trees mentioned in the Bible, some of whose identity we can only guess about today.

Years later, ecologists can explain this extraordinary species richness as a function of the unique location of this tiny land (containing only 22,000 sq km – roughly half the size of Costa Rica) that serves as a bridge between the continents of Europe, Africa and Asia and their contrasting assemblages of flora and fauna. Moreover, the extraordinarily steep rain gradient, that runs from as little as 10 mm of rain/year in the jejune drylands of the south, to 700 mm/year in the temperate lands of the Galilee only 300 kilometers away, allows for an idiosyncratic mixing of species and extraordinary variety within a very small area.

Unfortunately, modern natural history for Israel's non-human residents has taken a turn for the worse. A 2013 report by the Society for Protection of Nature in Israel, the country's largest environmental NGO, describes alarming trends: 23% of the freshwater fish are endangered; 83% of the country's amphibians; 35% of the reptiles; 60% of the mammals; and 30% of the plants are declining and some heading towards extinction.

There are many proximate reasons or 'direct drivers' behind the Holy Land's alarming loss of biodiversity. But all share a common denominator: as more people sprawled out across the countryside, with their ecologically unfriendly habits, there was less and less room for the other creatures that call Israel home. Against all odds, much still remains today, but unless public policies and demographic trends change, Israel's natural history will be one of a biological paradise lost.

The number of people living in Palestine over the ages has always waxed and waned, responding to the vicissitudes of warfare, disease, famine and political oppression. Some ancient historians reported millions of residents living throughout the land.

Archaeologists and historians today, however, tend to dismiss these claims as inflated. During the Iron Age there may have been over 100,000 residents in the country, although these numbers soon shrunk by two-thirds. The human population during the tumultuous Roman rule at its peak probably reached one million and even swelled a little beyond that several hundred years later during the Byzantine period. But the litany of conquerors and internecine violence, oppressive policies, land degradation, malaria and unimaginably bad hygiene barely allowed local denizens to replace themselves. During most of the past millennium, population in Israel rarely exceeded 300,000.

As long as the population of the country was modest, most ecosystems flourished. To be sure, thousands of years of human settlement took its toll. Even though the settlements were dispersed, massive abuse of the soil took place due to relentless overgrazing, deforestation and imprudent cultivation which took its toll on land fertility. Erosion was epidemic and catastrophic in its dimensions. Such a long and turbulent human past arguably provides Israel with more archaeological and historical sites than any place on earth per square kilometre. But it surely did little to enrich the country's non-human inhabitants and especially the ever vulnerable vegetation and trees. Over time they paid a heavy price for human activity which invariably took from the land but did little to renew it. Nonetheless, with hunting at modest levels, the vast variety of species and ecosystems did surprisingly well.

Besides the natural world appearing in the Bible, *Talmud* and other religious texts penned in the Holy Land, there are intermittent reports from travellers that survive, describing the natural world of Palestine over the centuries. The most famous of these was penned by Henry Baker Tristram, a British priest who visited Palestine four times between 1858 and 1881. Tristram's writings, later published in some five separate volumes upon his return to England, contain detailed descriptions of animals and plants that he saw along the way. Although professionally he always remained a man of the cloth and his children were missionaries, he was an early supporter of Darwin (and Wallace's) theories of evolution.

Tristram's knowledge, exceptional intuition and talent for writing provides a thorough cataloguing of the natural history of Palestine just as the sun began to set on the Ottoman Empire at the end of the 19th century. What we learn is that Palestine was home to a rich array of all kinds of animals: African mega fauna served as the high predators with cheetahs, leopards, bears, hyenas and crocodiles enjoying a rich variety of prey. Many species at the time were unknown. (There are six bird species and a couple of gerbils named after Tristram himself.)

The reason why so many animals thrived was not only the low density of humans and their general (non)interference, but also the relatively low availability of firearms for hunting. As guns became more accessable towards the end of the 18th century, hunting took on new dimensions. The population of Dorcas gazelles, a 'keystone species', which had always been a mainstay of the local ecosystems, became greatly depleted, with only 400 gazelles surviving by the mid-20th century. Many other species were not so lucky: for instance reptiles like the Levant viper, the Nile crocodile and the European pond turtle did not make it. Neither did the speedy cheetah, the local 'Caucasian' squirrel, the 'water rats' (European water voles), the lovely white oryxes, or the imposing Syrian bear that once roamed the Golan Heights. The local population of lions presumably was hunted out of existence long before this especially lethal period for mammals began, during the end of the Ottoman Empire at the turn of the 20th century, continuing throughout the British Mandate until the mid-20th century.

With the advent of British colonial rule came a strong conservation ideology. Accordingly, the first half of the 20th century should have been a time of prosperity for the land of Israel's natural systems. It was not. The British administration that oversaw the Mandate in Palestine between 1918 and 1948 was actually keenly aware of Israel's unique natural systems and was keen to repair them. Much of the impulse behind their efforts that established almost 200 forest reserves, protecting over 56,534 hectares of open spaces involved the desire to restore the natural history of Palestine to its earlier, Biblical splendour. In retrospect, however, there are many reasons why British rule was not the healthiest for Israel's ecosystems.

The lack of ecological expertise among the colonial government and the focus on planting forests that lacked indigenous integrity and diversity meant that many policies were misguided. And the considerable enthusiasm for 'the hunt' among the British male administrators themselves meant that serious regulation of hunting was never part of the government's conservation strategy. The ecological restoration that they did pursue was all too often an exercise in theoretical planning. When the Mandate came to a close in 1948, very little remained of the millions of trees their hundreds of government foresters had planted. Losses were primarily due to the vandalism and arson by the local Arab

community which resisted the colonial forestry proscriptions which excluded them from lands they had always seen as public rangelands for their herds of goats and sheep.

When the State of Israel was established in 1948, it inherited a countryside that was largely unpopulated. With the hostilities leading to the exodus of most of the Arab majority, there were hardly a million people living in the country and many more animals. The land of Israel was hardly pristine and it bore the signs of the aforementioned millennia of abuse. Almost all of the original woodlands were extirpated and desertification was advanced in many areas. But the novel ecosystems that emerged in place of the original wilderness contained a rich variety of animals, even though many populations had dwindled considerably after being hunted for more than half a century.

Immediately upon becoming independent, the government acceded to requests by Israeli zoology professor, Heinrich Mendelssohn to ban hunting, given the traumatized state of natural systems after years of armed conflict. This preference for the 'hunted' over the 'hunter' continues until this very day. In the decades following Israel's independence, there was still little information about the state of local biodiversity. For instance, it was thought that the ibex (the Biblical wild goat) and local leopards had been hunted into extinction. In fact, they had not; under the continued protection of Israel's new hunting legislation, the public delighted when they began to make an appearance. For many years their populations seemed to rebound.

Strict regulation of hunting was perhaps the less important part of the Israeli government's ecological interventions. The country's primary policies to protect biodiversity involved 'set asides'. After innumerable proposals and considerable parliamentary debate, in August 1963 Israel's Knesset passed the National Parks and Nature Reserve Law. The legislation created separate nature and national park authorities with the twin mandates of preserving habitats and heritage sites respectively.

For some thirty years, it was the Minister of Agriculture who oversaw the independent Nature Reserves Authority, even as the Minister of Interior signed off on the protected status of dozens of nature reserves as part of National Masterplan 'Number 8'. Today under the plan, roughly 250 reserves are located on about a quarter of the country's lands. Most of the reserves are small by international standards – with the largest in the sprawling, southern desert regions never exceeding 40,000 hectares – roughly a tenth the size of significant national parks such as the Yosemite. In the centre and northern Galilee regions, reserves tend to be far smaller: the largest, Mount Meron, is a little less than 10,000 hectares in area.

On reserves, regulations are stringent: there is no construction, few paved roads and, frequently, no camping or hiking off the trails. Humans presumably are visitors to these protected zones which typically are closed around sunset to give the animals a modicum of respite. Soon after the enactment of the law it became clear that animals and plants move around and that it was important to protect them even outside the confines of the newly declared reserves. A list of 'Protected Natural Assets' was compiled and codified as regulations which protected wild flowers, trees and all sorts of creatures, prohibiting their taking in any form.

In addition, about eight per cent of Israel's lands are designated as forests, where constraints are not as stringent, but which still serve as critical habitats and ecological corridors. The forests were originally planted as conifer monocultures and proved vulnerable to massive pest infestation and collapse. But over the years, new policies mandated the planting of more diverse strands, relying primarily on indigenous non-conifer species. As the succession process unfolds, more natural assemblages of trees make for more stable and richer forest ecosystems.

For much of Israel's history, this profound commitment to conservation yielded exceptional results: species abundance rebounded. Nature reserves provided a home to an astonishing variety of life systems. As the ecosystems recovered, the ecosystem services they provided became healthier over time.

Israelis' natural inclination to hike and take excursions into nature found dozens of new destinations as immigrants and veteran citizens got to know the many wonderful natural treasures of the country during the weekends or on holidays. One expression of this commitment to conservation was the very robust and often aggressive civil society that emerged to protect the environment. Chief among the conservation NGOs remains the Society for Protection of Nature in Israel. Founded largely by nature loving, kibbutz members in June 1954, the organization had no trouble attracting members from all walks of life and soon became the country's largest NGO with tens of thousands of paid members, wielding considerable influence among decision makers. A vibrant and diverse 'green' interest group emerged to consolidate these conservation gains and seek even greater protection for the creatures and plants living in the land.

During the country's first fifty years, Israeli biodiversity even made

something of a comeback. Several animals that had gone extinct locally were reintroduced through the 'Hai Bar' programme. The fallow deer, not seen locally since the Crusader days, was found in a tiny surviving population in Iran. A small group was flown into the country from Iran and became the core of a captive breeding programme that eventually was large enough for a release into reserves in the Galilee and the Judean hills. The country cheered when in November 2011 a pair of painted frogs reappeared. The frog was thought to have become globally extinct after its wetlands habitat was drained, and this was the first siting in some 50 years.

The 1960s, '70s and '80s were golden years for biodiversity and biodiversity protection in Israel. Strong legal protection, competent institutional capacity and enthusiastic public support all contributed to a collective sense of purpose and ecological restoration. When Israelis looked over their borders to those of neighbouring Arab countries, they saw that their country was not only literally greener due to an 800% increase in forest cover, but had far greater number of fauna species due to the protection they had received. The assemblage of plants and animals in the country were undoubtedly different than that which inspired prophets thousands of years earlier during the days of old. But these novel, Israeli ecosystems were still compelling, inspirational places where evolutionary processes continued to unfold and where animals were largely safe from the heavy hand of human progress.

When Israel joined the OECD in 2010, the international organization's constant monitoring offered a rare opportunity to evaluate the country's performance in a number of areas relative to other developed countries. In 2011, the first environmental report that assessed the state of biodiversity in Israel was issued. The country has a range of well known, significant environmental problems: from groundwater contamination to high greenhouse gas emissions. Nature protection was thought to be a happy exception – an area where the country excelled due to strong public policy. But the results of the data collected by the OECD analysts came out surprisingly negative: Already 34 vertebrates had become extinct. These numbers were just the tip of the proverbial iceberg. The report calculated that roughly 33% of the country's vertebrate species are endangered, with especially high numbers of amphibians and mammals at risk. The exploitation of the country's water sources have led to considerable extinctions among species in aquatic habitats. Indeed, Israeli mammal population are more endangered than that of any other developed country.

What is the reason for this dramatic change in performance and the dismal and discouraging present picture? After all, Israel's Nature and Parks Authority had recently commissioned a review of its activities by an international committee of experts. The conservation agency received kudos from the international evaluation of its scientific competency and the professionalism of its efforts. Relative to most countries, the public in Israel is extremely engaged in outdoor activities: from hiking and camping to rock climbing and cycling, millions of Israelis visit the country's forests and nature reserves each year.

From the very inception, love of nature was considered to be an integral expression of patriotism and school curricula include 'love of homeland' classes with annual trips to familiarize the next generation about their natural heritage. This passion was an important part of Zionism – the Jewish national movement that founded the country and appears to be relatively unique in its intensity. It is manifested in the country's diverse and very robust environmental movement. And yet, it seems that Israeli biodiversity, once an exemplar of conservation interventions' ability to stem negative trends, has gone into free fall. The OECD report was succinct in its assessment: 'Israel's biodiversity is subject to serious pressures from several sources: habitat fragmentation, the introduction of invasive species, over-exploitation of natural resources, and pollution. Demographic changes, economic development and climate change are the main drivers of these pressures.'

The report was reserved and understated in its analysis. Yet, the upshot appears to be clear. Israel's demographic growth has been extremely rapid. In 1950 there were but one million people in the country. Since then, the country's population has grown by one million people each decade. Today, Israel has over eight million citizens. During the country's first years, immigration was the major engine of demographic growth. Since that time, a high birth rate has been the major reason.

Israel's total fertility rate has reached 3.0 children per family on average – almost 50% higher than the next developed country, New Zealand whose TFR is only 2.2. This is not a coincidence. Government policies actually encourage large families and provide pro-natal subsidies, from generous child allowances to direct grants to new mothers. Not only is demographic stability nowhere in sight, the birth rate continues to increase with religious communities reaching average fertility levels of 6.5. This demographic policy is undermining conservation efforts and unravelling the achievements of the past.

The OECD report makes it quite clear in its assessment that population growth is responsible for a range of environmental negatives, especially to natural systems. When looking at the decimation of local wetland species it explains: 'Population pressures, continued construction activities and climate change will likely contribute to the continuation of this trend unless policy action is taken.' People require housing, roads and places of employment. As larger numbers become more prosperous, habitats are sacrificed for new neighbourhoods, communities and highways.

Humans also bring with them invasive species which supplant limited resources for local animals and plants, already under significant pressure. Over 200 endangered species of insects, 18 bird species, all manner of fish and a couple of mammals have been identified. Pollution control efforts are focused on human needs and often leave natural systems exposed to pesticides and other contaminants. Streams and springs dry up when water is tapped for human consumption, agricultural or domestic. Israelis may love nature, but given present densities, they challenge its ability to survive.

Ultimately, species diversity is a function of how much habitat is available. The so-called 'species-area effect' is one of the few ecological laws which appears to be highly reliable across a wide range of climates or topographies. Species numbers grow geometrically as the 'island' on which they live on increases in size. Because of its unique geographical features, the land of Israel came to support an unusually large number of flora and fauna species, especially given its diminutive dimensions. But as the country became cut up into urban and suburban islands by highways and urbanized centres, in many places the minimum amount of space required for the genetic diversity of a small animal community was no longer available.

Cooperation with Jordan, Palestine, Lebanon and Syria through establishment of 'peace parks' may possibly relieve some of the pressure and provide critical lands. Many such transboundary sanctuaries have been proposed by academics and NGOs. Sadly, Israel has not yet found governmental partners who are equally enthusiastic about such arrangements. On the contrary, over the past decade, uninvited influxes of refugees, contraband and terror have only precipitated Israel's proclivity towards building security walls and border fences. These greatly exacerbate existing habitat fragmentation.

Today, Israel appears to be at a crossroads. Against all odds, ecosystems have survived centuries of conflict and land degradation. During the past sixty years, Israeli conservation policies largely reflected the 'state-of-the-art' in the field and the national commitment to preservation has been significant, as manifested in an impressive network of nature reserves. But nature reserves are not inviolate. For example, the army is permitted to avail itself of many of the largest sanctuaries in the country for military manoeuvres. And just as the country declared reserves, in a relentless search for new lands for suburbs and cities, it can re-zone lands for residence. Ultimately, this is a political decision; people vote – and want to live in spacious homes.

It would seem that the state of Israel must make a choice: It can either change its demographic policies and stabilize population, incentivizing life in dense, but hopefully pleasant, urban environments. Or it can watch the slow and steady disappearance of its magnificent natural heritage. It cannot have it both ways.

Anthropogenic landscapes of the central Himalayas

VASUDHA PANDE

AN important aspect of Mountain Studies in the 1970s and 1980s was the articulation of an environmental orthodoxy about Himalayan degradation. Formulated in terms of a growing concern about *Limits to Growth*, it was also the theme of the first major environmental conference at Stockholm. This position is best represented by Eckholm's neo-Malthusian prognostications about erosion and deforestation.[1] He argued that the central threat to the future of mountains was the burden of burgeoning human numbers. This approach influenced and continues to influence research and policy on the Himalayan mountains. This 'myth', created orthodoxies wherein Himalayan peasants became part of global agendas, which did not necessarily recognize their role and agency.

Given this context, the Chipko movement (initiated in 1973 by Gaura Devi), attracted world wide attention because it placed the hill peasant at the epicentre of the mountain economy and revealed that mountain communities were not only aware of environmental problems but would resist outside interventions for exploitation and use of their forest resources. Ramachandra Guha's pioneering work,[2] which studied Chipko and resistance to forest policy in Kumaun in the 1920s, located the movement in the larger politics of antagonism to imperial governance and its takeover of the forests for conservation and for commercial purposes. It clearly implicated the colonial and post-colonial governments for heavy usage of timber and other forest resources but did not dent the argument of overpopulation and erosion, but rather affirmed it by linking deforestation to landslides and floods.

The problem with early research on environmental issues in South Asia was the focus on intensification of forest product use by a combination of industrial capital and imperial interests during British rule. The tragedy of the commons was seen as the prime mover, not only in the context of the modern world but even in the context

* This paper is based on research for a project at the Nehru Memorial Museum and Library, 2013-14, entitled 'Environmental Histories of the Central Himalayas' (unpublished manuscript).

1. Eric P. Eckholm, *Losing Ground: Environmental Stress and World Food Prospects*. Norton, 1976.

2. Ramachandra Guha, *The Unquiet Woods: Ecological Change and Peasant Resistance in the Himalaya*. Oxford University Press, 1989.

of the Himalayan mountains. As studies proliferated, more scholars pointed out the need to look at peasant communities in the hills and their use of forests and commons. The basic premise, however, was that forests have to be conserved, regenerated and even created to preserve the 'ecological integrity' of the Himalayan environment.

Interestingly, the peasant was now considered a stakeholder in the mountain ecosystem; in the process the role of groups (herders, pastoralists, foragers), not part of sedentary agricultural activities, was obscured. The standpoint of this perspective is that peasant movements like Chipko were not merely a defence of the little community and its values, but also an affirmation of a way of life '*more harmoniously adjusted with natural processes*' (emphasis added).[3] The argument that mountains were populated from time immemorial in the manner that they were at the onset of British rule and that this was the ideal to be reverted to became the new orthodoxy. The pre-modern/pre-colonial stretched out as a limitless undifferentiated expanse and was the point of equilibrium one could return to by conservation and afforestation.

Gradually, however, scholars started questioning assumptions about the linkage between population growth, deforestation, soil erosion and disruption of the hydrological cycle. Scholars like Michael Thompson, Michael Warburton and Tom Hatley interrogated this hypothesis and suggested that crisis was only one possible interpretation.[4] Jack D. Ives and B. Messerli's contention was that the Himalayan region is so varied in its geomorphology of agricultural landscapes that simple generalizations are counter-productive.[5]

In this fresh appraisal, the most enduring idea was that mountains consist of biotic regimes which are organized around and dependent on differences in altitude. It echoed the Unesco Man and Biosphere Programme of 1973 declaration that man's way of life, his habitat and land use and exploitation patterns are vertically differentiated. Studies of the Alps, Andes and the Himalayas noted similar cultural adaptations based upon an exploitation of multiple, attitudinally different production zones.

The concept of a mixed mountain agriculture system suggested that the key to the success of agro-pastoral transhumance in Himalayan valleys was the vertical oscillation of cultivators, herders and beasts following the vicissitudes of climate in an effort to exploit niches at several altitudinal levels. Thus adaptation to mountains is invariably premised upon multiple use of altitudinal niches or specialized use of one eco-zone. The concept of altitudinal zonation, better known as verticality,[6] helped in explaining the dynamic of mountain communities.

The intricate web that characterized the mountain economy in the Central Himalayas of the early 20th century was the product of a long historical process, which not only knit different altitudinal zones into an integrated economic unit but also accommodated various kinds of lifestyles and a variegated use of natural resources. During the 1930s, the settlements in the central Himalayan region, longitudinally located between the Yamuna and Sharada rivers, reveal atitudinal interactive networks spread from the Tibetan plateau in the trans-Himalaya, across the greater Himalaya with passes into Tibet and the use of alpine pastures in the upper Himalayas in the summer.[7] Immediately below the snow clad glacier region, where only one harvest was possible, crop rotation was practiced. The inhabitants were traders and pastoralists who migrated to higher locations of the alpine grasslands with animals in summer and to sub-Himalayan residences for trade in winter. They connected Tibet in the north to Kashipur in the south through trade in salt, grain, cloth and wool.

The middle mountains (with forests of oak and pine) also did not have fully sedentary peasant populations. Cattle maintained for manure had to be moved to places where fodder was available, resulting in high mobility. Millets were cultivated on the slopes and rice in hot malarial valleys. Human habitation avoided the valleys and homes were built on slopes. Terracing helped retain moisture for a system of agriculture primarily based upon monsoon rains and some canal irrigation from rivers. Below the middle mountains was the *Bhabhar*, a dry patch where the water disappeared into the shingles. This was inhabited in winter when entire populations moved to the Bhabhar to feed their cattle and produce a crop. Below the bhabhar was the Tarai, a little lower than the Bhabhar and the plains further south, where the water resurfaced producing heavy undergrowth. This was hot and malarial, and inhabited only in winter, except by the Tharus.

3. Ibid., p. 196.

4. Michael Thompson, Michael Warburton and Tom Hatley, *Uncertainty on a Himalayan Scale: An Institutional Theory of Environmental Perception and a Strategic Framework for the Sustainable Development of the Himalayas*. Ethnographica, Milton Ash Publications, London, 1986.

5. Jack D. Ives and Messerli Bruno, *The Himalayan Dilemma: Reconciling Development and Conservation*. Routledge, 1989.

6. John D. Murra, 'An Aymara Kingdom in 1567', *Ethnohistory* 15, 1968, pp. 115-151.

7. S.D. Pant, *The Social Economy of the Himalayans*. George Allen & Unwin, London, 1935.

The burning of grasses for luxuriant growth was a well established practice in the Tarai and provided livelihood possibilities in winter to traders, herders from the upper Himalayas, and peasant cowherds from the middle mountains. It was apparent that a change in one facet was linked to the other. Integrating this into an ecological narrative of the central Himalayas required a deeper insight into the warp and woof of this society. The breakdown of the sense of community in the colonial period was as important as the cultivation of the commons and the story of the people was larger than that of mere forest cover and natural habitats.

Anthropological research and ethnographic studies of Himalayan communities also furnished information about indigenous knowledge and land management strategies of agro-pastoral regimes. As detailed studies of the Himalayas proliferated, they attempted to integrate different disciplinary perspectives on nature, society, economy, ecology and environment. In this context Bruno Latour's suggestion that an asymmetrical approach regarding nature's influence upon society be replaced by an approach that is symmetrical, which documents changes in nature but considers society as the key factor in identifying how these changes are identified as problems, was of great significance. This opened up fresh perspectives on environmental issues.

For example, Arun Agrawal coined the concept of 'environmentality'; his work, based upon a growing genre of political ecology, argued that the government of nature had facilitated the birth of the idea of the 'environment'. Thus, by the late 1990s we find a growing realization about the manner in which historical agendas shape environmental paradigms. It was apparent that environmental problems were the result of long-term bio-physical processes and that long-term environmental histories were required to reveal the ever changing adaptive strategies of humans over long-term contexts because they illustrate a problematic relationship between man and nature, even prior to the onset of the modern epoch.

One of the important issues raised by environmental histories was how to define wilderness, and how to understand the constitution of pristine environments. The idea that pristine is untouched nature was difficult to sustain. The assumption that forest conservation and afforestation was simply about re-growth in degraded forests and a return to nature was now questioned and the search for pristine habitats revealed that even in forests and grasslands the 'hand of man' was visible in myriad ways. For example, wilderness was explained as a historical construct by William Cronon and the notion of sacred groves was also understood as an ecological object cum social construct by many South Asian scholars. In neither instance do we find any evidence of pristine environments.

An appraisal of wilderness is therefore an important point of entry for clues about changes in environment, and can open up a completely new way of looking at resource use. For example, the sacred deodar *daru ka vana* groves of Jageshwar appear to have been planted and nurtured, not only because of particular belief systems, but also for retention of water essential for the mining of borax, an important ingredient for metallurgical operations. In the case of the Uttarakhand Tarai, considered the most formidable wilderness from the early medieval period till the middle of the 20th century, folk memory refers to its habitation and depopulation nine times.

Historically, we have ample archaeological evidence to show habitation in the Tarai during the Mauryan ascendancy (3rd century BC), its relapse into the wild by the 9th century and its halting reclamation from the 15th century onwards. The Tharu settlements in the Tarai followed a pattern of bunding/damming of water channels, cultivation for a short period and then abandoning it for another site. Like in the Columbian forests, evidence of clearance would be obliterated by the fast growing thick and lush vegetation. Similarly, the annual burning of the grasses by herders was an important intervention in the transformation of the Tarai landscape and clearly suggests that it was not pristine.

Another point that environmental history foregrounds is the changing nature of connections with contiguous regions. In the early 20th century, Tibet was important for the central Himalayas because it provided salt, but as the connection with North Indian economy strengthened due to British rule, salt could be imported from the plains. At the same time, salt traders who also traded in wool found markets as far as Kanpur. It is interesting to find that the trans-Himalayan connection may be traced back to the 1st century BC when it started with gold mining and after the development of agriculture (from the 9th century) its commodity composition changed when salt was exchanged for grain (according to S.C. Das salt was mined from the 6th century), and it continued in an attenuated form even during British rule till as late as 1962.

An environmental history of the central Himalayas then helps depict major mutations and changes. The firing of the forests for grass inaugurates pastoral activity around 2000 BC;

we can surmise that bands of foragers probably also worked the forests from an early period. Studies by anthropologists J. Reinhard and J. Fortier of these foragers, known as Ban Rajis and Rautes in Kumaun and far western Nepal, help document a lifestyle now falling into disuse.[8] The early period begins with exploration of mineral resources followed by the development of coinage for trade leading to metallurgical skills and the development of tools and metal statuary. Historically, we find early evidence of mining of copper and iron from the Himalayan mountains. Copper anthropomorphs and other artifacts found in the lower and middle Himalayas have been conjecturally dated to second millennium BC, but we have a definitive date for Uleni. (Uleni, 8 kms north of Dwarahat at a height of 1200m AMSL, lies on a small rivulet in the upper Ramganga basin.) Heaps of slag and many iron objects were found in Uleni. Slag was also found in a rock shelter in the area known as Tamakhani. Uleni was an iron smelting and working site with a calibrated date range of 1022-826 BC.

The history of the central Himalayas reveals an interesting pattern from this period. Ranihat (on the Alaknanda) near Srinagar, Garhwal has three continuously inhabited occupational periods – first, from 600-400 BC, iron and copper smelting; second, from 400-200 BC, burnt brick varieties of pottery; third from 200 BC-200 CE, floors using stone with expertise in iron smelting and manufacture of iron tools. The people of Ranihat, it appears, specialized in smelting of iron from locally available ore and manufactured iron tools for hunting and fishing. (In the 19th century, iron mines were worked in the neighbouring areas of Chandpur, Belugh, Bichan and Cholah.)

Ranihat was not the exception and copper bangles found in Thapli on the banks of the Alaknanda are dated to the 1st century BC. Another site in the mountains is Purola on the left bank of the Kamal river (Yamuna) that yielded the remains of pottery assignable to circa 1st century BC to 2nd century CE, along with a copper coin of the Kunindas, and a thin gold leaf impressed with a human figure. We, therefore, have evidence for use of copper, iron and gold (from Himalayan rivers and Guge in western Tibet). The importance of copper, gold and iron technology has to be understood for the significance of the Kuninda economy, whose coins, silver and copper, have been found in different parts of North India and in the central and western Himalayas. The large range of Kuninda coins suggest trade networks not only in North India but also in the trans-Himalaya. The use of copper and iron of the western and central Himalayas and gold of the upper Himalayas and trans-Himalaya in the period from 100BC-300 CE indicates a significant development of metallurgical skills (even using lead and tin) and established use of mineral resources.

By the 3rd century CE, the Kuninda kingdom was in decline and the large network that it established broke up leading to the development of smaller polities practicing metal technology for local use. Interestingly, some trade networks were disrupted and in others the commodity composition changed. New habitations started around the 4th century which now constructed *naulas* or water bodies. Iron tools were used for making stone floors and by the 7th century stone was used for temples and dwellings as well. Metal technology also expressed itself in beautiful statuary and tridents from the 6th century onwards. The temple at Jageshwar, with its beautiful statue of the Pon Raja, is an outstanding example.

The rise of the Tibetan empire in the 7th century and its break-up in the 9th century probably generated heightened activity in contiguous regions in the central Himalayas. As a matter of fact, the Katyuri kingdom emerges at Pandukeshwar in the upper Himalayas, near the pass to the Tibetan plateau, around the break-up of the Tibetan empire. The 9th and 10th century copper plate grants suggest intensification of agro-pastoral activity. Later, with the further diffusion of agricultural activity, the middle Himalayas were populated and copper and iron technology was now applied for making agricultural implements and copper utensils. Mining of copper and iron and manufacture of tools and utensils was an important activity, and in the Mughal period the region was known for its exports of these goods. This continued till the early 20th century, when import of copper and iron from England rendered mining unviable.

Interestingly, around the 8th and 9th centuries, the Tarai lapsed back into wilderness, coinage disappeared, trade with the south ceased but trade with trans-Himalaya continued. Yet, it is important to remember that this region was on the Pasupata Lakulisa pilgrim circuit, which entered the Himalaya from Kathmandu in Nepal and went on to Kedar; another pilgrim circuit went to Kailash Mansarovar and nurtured the trans-Himalayan

8. Johan Reinhard, 'The Raute: Notes on a Nomadic Hunting and Gathering Tribe of Nepal', *Kailash, A Journal of Himalayan Studies* 2(4), 1974, pp. 233-271. Also, Johan Reinhard, 'The Ban Rajas: A Vanishing Tribe', *Contributions to Nepalese Studies* 4(1), 1976, pp. 1-22. www.johanreinhard.net/Home; Jana Fortier, 'Reflections on Raute Identity', *Studies in Nepali History and Society* 8(2), 2004, pp. 317-348.

connection. The pilgrim route brought into prominence peripatetic ascetic groups such as the Nathpanthis and Dasnam Gosains, who sustained long distance trade with the rest of the subcontinent.

A detailed analysis of historical documents interrogates an important fallacy regarding the development of agriculture in mountains, which is that cultivation begins from below, along the banks of rivers, and extends uphill as the population increases. Even S.D. Pant, otherwise an astute observer of hill cultivation, suggests that agriculture begins from a series of irrigated fields on the river bank, spreads to patches of alluvial and unirrigated areas above the river bed, and finally reaches the gentle slopes and ridges, which do not admit of cultivation without terracing. This is echoed in a large number of Brahman genealogies, which claim that knowledge of cultivation (particularly rice) came with them from the Indo-Gangetic plains.

An important point about Himalayan river valleys of the middle Himalayas is that they were not conducive to human habitation because of the *aul*, Kumauni term for malarial fever. We noted earlier that invariably homesteads were in the middle reaches (not in the valleys with noxious vapours) facing the sun and used water springs below the forests. Terracing began from the upper reaches where the cattle were reared and followed the contours of the tracks made by animals during grazing. These tracks provided the cultivator with an assessment of the size of the field that could be carved out of the hillside. The terraced field that emerged from this process had to be shored up with a stone wall, which required constant repair. The terraces of this region are an answer to problems of cultivation in the ridges – retention of moisture and run-off of soil nutrients. This process appears to be similar to terracing in the Andes mountains where terracing also began from the higher reaches again because of malaria in the lower valleys.[9]

The development of terracing could sustain larger populations who could then be mobilized for clearing valley floors and for introduction of rice cultivation. Rice appears as an important crop from the 12th century onwards, we also have evidence about the use of the plough and irrigation channels. The attendant demographic increase (because of rice cultivation) was subsequently channelized into reclaiming the Tarai from the 15th century onwards. The colonization of the Tarai remained a patchy affair because of the ebb and flow of population caused by an unhealthy environment adding to its notoriety with the local population. In the 1960s, the advent of DDT and a huge influx of displaced persons from East and West Pakistan completely changed the scenario.

The many stories of changing landscapes in the central Himalayas reveal an inherent dynamism that counters the stereotypical image of unchanging mountain villages *subsisting* in a timeless pristine landscape, now unsustainable and degraded because of increasing population. The gradual extension of cultivation, on slopes and later valleys in the middle Himalayas and then the extension into the Tarai reveals a story of the mountains as inextricably linked to the ebb and flow of human populations. It may be useful to invoke here Ester Boserup's response to the Malthusian predicament suggesting that increasing numbers could motivate cultural and technological innovation.[10] This happened in the central Himalayas in the medieval period, evident in terracing, irrigation and introduction of rice.

We also need to recognize that agro-pastoral regimes in the mountains are not only interconnected vertically but are also part of subcontinental trade networks. In the early years of the 20th century, as the Kumaon Division was integrated into the Imperial economy, residents looked for opportunities southwards, outside the mountains. Increasing numbers and intensification of agriculture probably peaked around the 1960s. Over the years, as male out-migration increased, agricultural production was increasingly feminized and Chipko was, primarily, a women's movement because the men were absent.

The agitation for Uttarakhand in the 1990s culminating in the formation of Uttaranchal (later Uttarakhand) in 2000, not only signalled the problem of agrarian decline but also reflected new aspirations. In the decade and a half old state of Uttarakhand, today, the general lament is about the unsustainability of agriculture and the need to innovate. Meaningful policy interventions need to move beyond anxiety about pressure on land and attempts to restore 'subsistence' agriculture and forest cover, to innovating novel ways of coping with resources, human and natural, which is the way of humankind.

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South Asia's coastal frontiers

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IN June 1955, a group of scholars convened in Princeton for a conference on 'Man's Role in Changing the Face of the Earth.' They were geographers, ecologists, political scientists; while most participants were American, people came from around the world, including India. They were not the first to consider this question: George Perkins Marsh, a US diplomat and geographer, had in 1864 published his *Man and Nature; or, Physical Geography as Modified by Human Action*. His influence was invoked more than once during the proceedings at Princeton. By the time of the 1955 conference, however, it was clear that the scale of 'man's role in changing the face of the earth' had in the 20th century escalated beyond all precedent – a result of industrialization, urbanization and population growth.

Opening the conference proceedings, E.A. Gutkind noted that the 'conquest of the air' had made possible a new way of envisioning environmental change. From the air, he argued, 'we can see side by side the different scales in time and space and the tensions arising out of the neighbourly proximity of seemingly incompatible transformations of the earth's surface.' This was exactly the experience of Richard Upjohn Light – neurosurgeon at Yale University's medical school, amateur aviator, and later President of the American Geographical Society – who undertook a 29,000-mile journey around the world in a Bellanca Skyrocket seaplane two decades earlier, in the mid-1930s. His global circumnavigation took him over India and across the Bay of Bengal; the record of his aerial journey across the Gangetic plain and along the coastal arc provides a revealing snapshot of environmental change in South Asia.

Light's aerial photographs charted the shift from dense cultivation along the river deltas to the jungles of the frontier. 'The sight of the great delta lands aroused our particular interest', he wrote as he described his journey up the eastern seaboard of India, from the Godavari delta towards Calcutta; 'for this coastal belt holds one of the most concentrated populations in the world. The fields were bright green with rice paddy and dotted with giant palms and mangroves.' From Calcutta he flew down the 'great crescent' of the Bay of Bengal: Light wrote that 'the vegetation of the peninsula did not change much' from the Bengal Delta down along Burma's western coast up to Penang. But 'from that point to Singapore the wild country had been tamed and given over to rubber plantations, laid out with the regularity of carefully kept gardens.' This aerial view of the land is, as

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Gutkind put it, 'like a seismograph recording the finest oscillations of man's role in changing the face of the earth.'

In South Asia, as elsewhere, coastlines constitute both a human and an ecological frontier. Michael Pearson, historian of the Indian Ocean world, characterizes 'littoral' societies as zones of ambiguity, where 'land and sea intertwine and merge.' The Bengal Delta, where the great Himalayan rivers Ganga and Brahmaputra meet the sea, is quintessentially a hybrid zone of the kind Pearson describes: 'There are no boundaries here to divide fresh water from salt, river from sea', writes Amitav Ghosh in his novel of the Sundarbans, *The Hungry Tide*. In Ghosh's evocative description, which stands in a deep tradition of Bangla writing about the Sundarbans, the Bengal delta is depicted as an 'archipelago of islands' – 'the trailing threads of India's fabric, the ragged fringe of her sari.' Seen from a height, that flattened landscape of interbraided channels and shifting tributaries appeared all the more striking.

But the aerial snapshot provides a partial view. At a single moment, Gutkind suggested, we can see 'side by side the different scales in time and space' and the 'neighbourly proximity' of the unchanging and the unrecognizable. But the simple juxtaposition of lands untouched and lands transformed by 'man's impact' – then, as still today – can obscure as much as it reveals. It is a fundamental insight of the field of environmental history that landscapes which appear 'natural' are often the product of human intervention, adaptation, and appropriation.

The Bengal Delta, for instance, shaped by the enormous natural forces of silt and wind, has long been a space of human settlement, as Richard Eaton's work has shown – 'nature' and 'culture' have for centuries been entwined. The Bengal delta was an ecological as well as a religious frontier: groups of settlers led by Muslim *shaikhs* pioneered the transformation of eastern Bengal into a region of intensive rice cultivation, encouraged by the Mughal authorities to subdue the uncultivated, uncivilized forest. Conversely, landscapes that we take for granted as the product of human labour are often surprisingly recent products of human interactions with nature. The emergence of Bengal as a land of settled rice cultivation was in part a consequence of colonial policies – both legal interventions and hydraulic engineering – to firm up and impose a distinction between productive land and unproductive water.

The cultures and economies of the coast have evolved in complex relationship to the environment. Over centuries, the coasts of India have sustained a large population of coastal fishers; to this day, India is home to the largest number of coastal fishers anywhere in the world. They share many of the distinctive features of coastal societies: the reliance of fishing communities on the common property resources of the sea; the exhaustible nature of the coastal harvest, and the greater physical danger associated with coastal livelihoods compared with many forms of agriculture. The perishable nature of the sea's produce, and the reliance of coastal communities on exchange to procure staples like rice and wheat leave their 'exchange entitlements' particularly vulnerable in times of crisis.

South Asia's coastal peoples have also confronted the hazard of periodic tropical cyclones for which the Bay of Bengal and the Arabian Sea are notorious: they have evolved ways of adapting to the furies of nature, seeing cyclones as a recurrent, expected, even a 'normal' hazard of coastal life – albeit a hazard that has exerted a huge toll in lives lost and livelihoods destroyed.

James Hornell (1865-1949) was a British fisheries official who devoted years of his life to understanding the fisheries of India's eastern coast. At the turn of the 20th century, Hornell travelled to Ceylon to survey the marine fisheries there. From 1908 to 1924, he played a leading role in running the Madras fisheries department; he undertook detailed studies of coastal fisheries, on the economy of fishing and the changing composition of the catch; he developed a particular fascination with indigenous fishing vessels along the coasts of the Indian and Pacific Oceans, on which he published over a hundred articles in his lifetime.

In 1917, he described the daily scene on the shore at Tuticorin (Thoothukudi), long a centre of India's pearl fishing industry. 'There is no wholesale fish market except the beach, there are no companies or large owners controlling each a number of boats, and while there are certainly some fish salesmen and traders, these men seldom or never keep any accounts', he reported. 'The catch is usually thrown in a heap on the beach and the "lot" as it lies is sold by auction – the buyers must appraise its value by eye, and make their bids accordingly.'

Hornell's depiction of the fishing market as individualistic and unorganized failed to recognize the success with which local capital triumphed over both Portuguese and Dutch efforts to control the pearl fisheries. At the same time, Hornell's admiration for the quotidian creativity and adaptive genius of local coastal communities is worth revisiting. The sense of a timeless, unchanging coastal culture does not withstand scrutiny. Coastal fishing communities in South Asia have been

at the forefront of religious change – their outward orientation, their familiarity with the technologies of seafaring, put them in early contact with influences from distant shores. The Tamil-speaking Muslims of the Coromandel Coast, for instance, flourished through their contacts across the Indian Ocean: as fishers and traders, ship owners and migrants.

To this day, thousands of young men and women from the coastal fishing towns of Tamil Nadu and Kerala set out for the Gulf, or for Southeast Asia, in search of better opportunities. India's coastal communities have developed an intimate relationship with the changing ecology of the coast: the environmental history of coastal India is also, that is to say, a social and a cultural history of the peoples who live by, and from, the sea.

Although they all began as coastal trading enclaves, European empires in Asia developed a terrestrial obsession in the 19th century. After 1857 the Raj consolidated its hold on the *land* as the basis of imperial rule: mapping, surveying and assessing territory; settling nomadic peoples; seizing common property and forest resources for the state. The impact of the colonial port cities reached simultaneously inland and overseas.

The half-century after 1870 was pivotal: a period of relentless energy that altered, permanently, the societies and the ecology of the entire coastal rim. After the opening of the Suez Canal in 1869, steam shipping made Indian Ocean crossings cheaper, faster, and safer than ever before; undersea telegraph cables facilitated the instantaneous transmission of information – including information about markets and prices. Land and sea routes converged as radials upon port cities that pulsed with people. The commercial life of the Bay of Bengal drew the products of the land, and the sons of the soil, into its steam-powered web.

The Bay of Bengal's circuits of migration, and the transformation of its ecology, both responded to and fuelled environmental change on a global scale. Malaya's rubber – tapped by Tamil migrant workers – fed the American automobile industry. Malaya became the most economically valuable tropical colony across the British Empire. Burma became the largest rice exporter in the world, in a boom backed by Indian capital and drawing millions of Indian migrant workers into every sector of its economy.

There were more than twenty-eight million passenger journeys across the Bay of Bengal, in both directions, between 1840 and 1940. The region was home to one of the world's great migrations – but almost certainly the least well known. At the same time millions moved upriver, along the Brahmaputra, to work on the tea plantations of Assam. All of these currents of migration were, in various proportions, coerced by the colonial state and planters, induced by the promises of labour recruiters, or propelled by caste, village and family networks. Migrant labour transformed the landscape of the coasts and far inland – creating precisely those contrasts and juxtapositions that the aerial photographers of the mid-20th century saw so starkly.

Environmental historians have written of the environmental impact of a 'great acceleration' in human beings', in the second half of the 20th century – it was at the beginning of this accelerating impact that the Princeton conference on 'Man's Role in Changing the Face of the Earth' met in 1955. The American model of an energy intensive, automobile focused consumer society had an enormous footprint across the tropical world, even while it competed for global influence with the Soviet model – every bit as profligate with energy and resources. In newly independent countries across Asia and Africa, the promise of development captivated hearts and minds. Across ideological divides, a new faith in the power of technology to conquer nature underpinned massive projects of infrastructural development.

In the era of the developmental state, many of Asia's states turned their backs on the sea. They turned inwards: towards the development of their resources, towards the mobilization of their workforces, towards securing themselves from the fluctuations of trade and fortune that so many remembered had proved disastrous in the 1930s and 1940s. Paradoxically, as the sea no longer provided the lifeblood of commerce and as it faded slowly from the imagination, human activity began to affect the sea itself as it transformed coastal environments at an unprecedented pace. As the political and economic connections across the Bay of Bengal came apart, a new phase in its environmental history – a new ecological interdependence – took root.

Realization of this shift was slow to dawn, until its demands became insistent and its effects undeniable. From the 1950s, and with growing force from the 1970s, the effects of population growth and land clearance, the effluents of industrialization and the damming of rivers, have changed, permanently, the very nature of the Bay of Bengal. The warming of the earth's atmosphere as a result of human activity has already made itself felt upon the world's seas.

The coasts are a productive site at which to consider the intersection of ecological, cultural, and economic change. Coastlines by their nature are unstable, continually shifting; the coasts of India have changed constantly. But the period since 1970 has

seen a quantitative and qualitative shift – a steep change – in anthropogenic impact. The coastlines of India and the Bay of Bengal's crescent have shifted more rapidly in the past thirty years than in the preceding millennium.

Coastal wetlands have been concreted over; natural drainage channels have been eviscerated; hydraulic engineering – dams, channels, canals, embankments – hardens the shape of fluid littoral zones. Pollutants spill into the ocean from coastal industries; the Bay has become, in the words of a recent scientific report, a 'sink of organic and inorganic wastes.' Because of the size and number of the rivers that feed into it, and the density of population around its rim, 'the total amounts of nutrients reaching the Bay of Bengal …must be close to the highest in the world', and these include, 'metabolized drugs, medical wastes, cytotoxic, antibiotic and hormone-mimicking materials, bacteria, viruses and worms.'[1]

The coasts are where the effects of 'regional climate change' – alterations in land use and water flows, changing patterns of rainfall – intersect most directly with the effects of planetary warming, with global causes: manifested above all in rising sea level, and more intensive storm surges.

Twentieth century attempts to liberate the Indian cultivator from the 'tyranny' of the monsoons have, through a cascade of unintended consequences, increased the vulnerability of hundreds of millions of people to rising sea levels and more intensive storm surges. The world's great river deltas – which host some of the largest concentrations of population on earth – are sinking faster than sea levels are rising: South Asia is among the regions most acutely affected. C.J. Vörösmarty and colleagues have shown that as a result of human intervention, much less sediment reaches the river deltas than would occur naturally – sediment that is essential for the deltas to sustain and replenish themselves. The predominant role is played by projects of hydraulic engineering, epitomized by large dams, which proliferated in the second half of the 20th century.

The trapping of sediment by dams far outstrips the effects of land clearance and construction in displacing it; rather, bypassing 'an important natural filtration system', storm surges and floods carry displaced sediment directly to the sea, while large quantities remain trapped in reservoirs. Reservoirs have increased by six or seven hundred per cent the volume of water held by rivers. A further cause of the subsidence of deltas is the sediment compaction caused by the over-extraction of groundwater for urban and agricultural use – a perennial problem in India, Pakistan, and China – and, increasingly, the effects of removing oil and natural gas from the delta's underlying sediments.

While the coast bears the scars of hydraulic engineering inland, and stands vulnerable to changes in the world's oceans, human intervention in the immediate coastal zone plays a major role in putting people at risk. Coastal erosion in Tamil Nadu owes at least as much to local construction projects and changing land use as to larger-scale hydraulic interventions or climatic change. In particular, the massive port construction projects that line India's eastern seaboard have led to beach erosion further up the coast.

There are currently 46 port construction projects underway in India, with a total investment of US$ 14 billion; there are over 80 on the drawing board. After decades of concentration in a few large ports, smaller ports are booming again. India's trade with Southeast Asia has grown rapidly, though it lags far behind China's trade with that region. As a result of Free Trade Agreements in goods and services, signed in 2009 and 2012 respectively – in the face of substantial domestic opposition in India – the value of India's trade with Southeast Asia has more than doubled in a decade, reaching US$ 80 billion in 2012.

The environmental history of the coast, that is to say, is shaped by the reconfiguration of the Bay of Bengal as a region, now again connected by the movement of goods and capital and people, after a period of interruption in the mid-20th century – a new regional formation that is connected, in complex ways, to the Bay's long history. The rush to construct thermal power plants on India's coast has displaced fishing communities, and interferes with delicate coastal ecosystems.[2] The controversy surrounding the construction of the Kudankulam nuclear power plant exemplifies the tendency for local concerns over the safety and the impact of these facilities to be swept aside in Indian industries' voracious hunger for energy.

The risks of coastal environmental change are experienced nowhere more strongly than in Asia's coastal cities. Asia's urban population grows by 140,000 people each day; overall, it is projected to have doubled from 1.25 billion in 2000 to 2.4 billion people in 2030. Coastal cities account for a significant part of that growth; more so if we consider the strip of land within 100

1. Urusla L. Kali, 'Review of Land-Based Sources of Pollution to the Coastal and Marine Environments of the BOBLME Region.' Bay of Bengal Large Marine Ecosystem (BOBLME) Theme Report GCP/RAS/179/WBG.10 (March 2004).

2. See http://indiatogether.org/water-concerns-near-coastal-thermal-power-plant-krishnapattanam-cheyyur-environment, last accessed on 10 July 2015.

kilometers of the coast – within which 12 of the world's 16 largest cities are situated; and which, in India, includes not only Kolkata, but fast growing cities like Surat.

Their residents face the multiple threats of sea level rise, and a predicted increase in the severity of tropical cyclones and storm surges. The natural drainage of the river deltas have been eviscerated by concrete. The land upon which they are built is sinking – Mumbai is built upon reclaimed land, as are large parts of the Pearl River Delta in China, now the world's largest urban corridor; 35 per cent of Bangkok's land area could be underwater by 2030. Already, the consequences have been grim.

Since 1950, more than 1.3 million people have died during cyclones in coastal areas of the Bay of Bengal; 10 million people a year across Asia are affected directly by flooding and storm surges. In an era of climate change, these risks look set to multiply. By 2070, half of the population worldwide at risk from coastal flooding will live in just ten mega-cities: nine of them are in Asia, the top three – Kolkata, Mumbai, and Dhaka – in India and Bangladesh. At the same time, the cities' own water needs are ravenous, and they draw water from further and further away.

The formative text of the Indian environmental movement – *The State of India's Environment: The First Citizens' Report* – paid close attention to the economic and ecological challenges facing India's coastal fishers. On the problems of India's rivers, the report delivered a stark warning: 'River pollution in India has reached a crisis point. A list of India's polluted rivers reads like a roll of the dead.' Ethnographic work, including Ajantha Subramanian's fine study, has examined contests for space and livelihood on India's coasts. Notwithstanding this, South Asia's coasts have received little attention from environmental historians. This is, perhaps, yet another symptom of the stark division – intellectual, institutional, and imaginative – between the land and the sea.

Historians of the Indian Ocean have shown how long distance flows of ideas, information, and religious devotion have linked coastal regions; but they often write of port cities in abstraction from their local environments. They focus on far-flung oceanic connections while often saying little about rooted peoples – fishers and others – who live by and from the sea. By contrast, histories of power in modern South Asia have their eyes firmly on the land. They envisage power in terms of the surveying of territory, the exploitation of resources, and the immobilization of people: the development of a terrestrial governmentality, tied to a developing notion of a closed, bounded economy. In histories of South Asia, forests, not the coasts or the seas, provide the focus for accounts of the expansion of state power over nature. To redress this imbalance between histories of mobility and immobile histories of power, the coast – the liminal zone between the land and the sea – offers possibilities.

There is no question that the scale and pace of coastal environmental change are unprecedented and growing more urgent; yet natural hazards have always been a fundamental feature of coastal life, and there is much to learn from how India's fishers and other coastal dwellers have adapted to that threat, how their understandings of the coastal environment have evolved, and how they interpret the political and scientific discourse of climate change. Similarly, there is much to learn from the history of political, economic, and cultural connections across South Asia's coastal frontiers. In an earlier era, accelerated environmental change around the Bay of Bengal's rim was accompanied by a rich circulation of ideas. As the environmental crisis binds the lives and fortunes of coastal peoples across national borders, history can provide an imaginative resource for new ways of imagining connection, solidarity, and shared vulnerability across space and time, and across political and cultural frontiers

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Accidents of history

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THE newly fashionable term, the Anthropocene, is a geologically distinct age that defines the advent of the human imprint on ecological systems.[1] As proposed by Crutzen, it begins roughly in the late 18th century, corresponding to the first appearance of carbon dioxide (CO_2) and methane (CH_4) in trapped air from polar ice cores.[2] This era coincides conveniently (and perhaps not coincidentally) with the invention of the steam engine in 1784 and the revolutions that followed in its wake. The term, while certainly useful, embodies a profound defeat, an ongoing mass extinction as clear and as dramatic as that other catastrophic geological transition – the KT boundary.

In recognizing the centrality of the human touch to the ongoing sixth mass extinction,[3] the Anthropocene confers all humanity with the same destructive power as a planet-destroying asteroid. Regardless of its unquestioned authenticity, it says something semiotically revealing of the environmental scientist's rather despairing vision of human history. Like the rock that caused the Chicxulub impact, humanity itself in the Anthropocene is conceived as something external, an exogenous (if not strictly extra-planetary) influence, not inherently part of the system. The 'natural order' of things does not account for contingencies as large, as messy and as unpredictable as meteorites or, indeed, in the view of environmental scientists, as human history.

The eschatological narrative of conservation activism has its positive counterpart in conservation science that looks in the opposite direction, towards Eden, for its inspiration. Although still founded firmly in its catastrophist roots, conservation science has always been an aspirational, hopeful and purpose-driven enterprise, which is not secular to outcome. Almost by definition, it is a strongly preservationist field, seeking a retreat to a more pristine past. This is clearly an ideological rather than a rational position, and raises valid questions of how appropriate it is for the field to arrogate to itself the same epistemic status as the putatively more value-neutral sciences. Its basic Edenic approach, however, has its foundations in the study of ecology itself.

In our attempt to make sense of the cluttered chaos of natural systems, we conceive of a 'pure ecology', untainted by human influence, where we are free to hunt for its general laws

1. W. Steffen, et al. 'The Anthropocene: From Global Change to Planetary Stewardship', *AMBIO: A Journal of the Human Environment* 40, 2011, pp. 739-761.

2. P. Crutzen, 'Geology of Mankind', *Nature* 415, 2002, pp. 23-23.

3. G. Ceballos, P. Ehrlich, A. D. Barnosky, A. García, R. Pringle and T. Palmer. 'Accelerated Modern Human-Induced Species Losses: Entering the Sixth Mass Extinction', *Science Advances* 1, 2015, e1400253.

4. G. Cooper, 'Generalizations in Ecology: A Philosophical Taxonomy', *Biology and Philosophy* 13, 1998, pp. 555-586; J. Lawton, 'Are There General Laws in Ecology?', *Oikos*, 1999, pp. 177-192.

and unified theories.[4] The proper study of ecology, by this reckoning, becomes an examination of species and their interactions, both with each other as well as with their habitats across time and space, in as close to their 'natural state' as possible.

If these natural states cannot be found in the real world, ecologists are happy to replace them with caricatured versions – with mesocosms (ecosystems in bottles) or with computational models – of idealized ecosystems. While this approach has led to important universal insights on how ecological communities work, it has also contributed to an ecology that belies the existence of humans as valid interactors in the system.[5] Ecological theory and its aspirations for universality develop in a space separate from and independent of human historical processes. Within this framework, human influence is almost always conceived as an externality, and there has grown a large research programme dedicated to documenting how the human stain corrupts the natural order, leading to the extinction of species, the unravelling of ecological interactions and the destruction of habitats.[6]

It is not surprising then that when ecological theory gets transubstantiated into conservation science, it takes on preservationist hues. As Evan Eisenberg argues, the audacious ambitions of conservation are to reclaim the dream of Paradise.[7] Our networks of national parks aspire to be reconstructed Edens, complete with its high walls and flaming swords of hermetic protection. A. Starker Leopold, son of Aldo Leopold and a conservation thinker himself, expressed it most explicitly when he wrote in 1963 about his vision for Yellowstone National Park: 'A national park should represent a vignette of primitive America', and while acknowledging that 'restoring the primitive scene is not done easily nor can it be done completely,' argues that 'a reasonable illusion of primitive America could be recreated, using the utmost skill, judgement and sensitivity. This, in our opinion, should be the objective for every national park and monument.'[8]

What is curious about this construction is that, like Eden itself, it is an attempt to abjure history. Within the boundaries of this Eden, a dynamic stasis prevails in which pure ecology can play itself out, uninfluenced by contingent exogenous forces.[9] While not exactly negating that history exists (which would be blatantly foolish), the preservationist ideal is one in which it is banished beyond the fenced boundaries of the Protected Area.

I will fully admit that what I have outlined is a naive caricature of the preservationist position, but it has important consequences for how we construct the ecologies of the systems we seek to understand and even more profound implications for how we intervene to manage them. I will attempt to explore some of these implications using a case study approach from the marine systems in which I work. Nearshore marine ecosystems in India have always been multiple-use environments, and it has been much more difficult to define spatially explicit and user exclusive tenurial rights over bodies of water than it has been on land. As a result, the strongly preservationist bent of much terrestrial conservation is much less prevalent in marine systems. The understanding and management of marine ecologies, needs must, have had to engage with the dynamic contingencies of historical forces.

Taken together, these examples suggest that history is a critical lens through which we need to interpret the

5. Paul Feyerabend in 'Against Method' argues that this curious abnegation of human history is characteristic of all natural sciences, whose programme is to arrive at objective 'bare facts', uninfluenced by the vicissitudes of history, culture and creative eccentricity that all strongly influence the ideational foundations on which all theory rests. Feyerabend argues that this is a naïve (if presumptuous) philosophical starting point and proposes a rather more anarchic approach to knowledge-making across all of natural science (P. Feyerabend, *Against Method*. 4th edition. Verso, New York, 2010).

6. A.D. Barnosky, P.L. Koch, R.S. Feranec, S.L. Wing and A.B. Shabel. 'Assessing the Causes of Late Pleistocene Extinctions on the Continents', *Science* 306, 2004, pp. 70-75; D. Burney and T. Flannery. 'Fifty Millennia of Catastrophic Extinctions After Human Contact', *Trends in Ecology and Evolution* 20, 2005, pp. 395-401; J.A. Estes, et al., 'Trophic Downgrading of Planet Earth', *Science* 333, 2011, pp. 301-306; A.D. Barnosky, et al. 'Approaching a State Shift in Earth's Biosphere', *Nature* 486, 2012, pp. 52-58. Nature Publishing Group.

7. E. Eisenberg, *The Ecology of Eden*. Alfred A. Knopf, New York, 1998.

For a detailed discussion of the pursuit for Eden and it's environmental consequences, see Richard H. Grove's *Green Imperialism: Colonial Expansion, Tropical Island Edens and the Origins of Environmentalism, 1600-1860*. Cambridge University Press, UK, 1995. Grove traces the birth of environmental movements in the wake of the dramatic changes wrought by colonial powers in their search and subsequent modification of 'pristine' tropical paradises.

8. A.S., Leopold, S.A. Cain, C.M. Cottam, A.N. Gabrielson and T.L. Kimball, Wildlife Management in the National Parks: The Leopold Report. The National Park Service, 1963.

9. There is a large research programme that views ecosystems as inherently non-equilibrium systems where natural disturbances, more than any other biotic or ecological processes are the dominant structuring agents of ecosystems – making them essentially non-deterministic and unpredictable. None of this body of work diminishes the arguments in this paper. For one, these theories still seek their universality independent of human historical processes. For another, conservation ecology, for the large part, is built strongly on the more teleological foundations of ecosystems as self-contained, dynamically homeostatic systems; healthy ecosystems in this conception, when properly conserved, are resilient to change.

functioning of ecological systems. I explore the potential value of including history as a driving variable in ecological systems, endogenous to, rather than external from the system itself. I also suggest what it may mean to an ecological research programme to embrace this historical lens as a factor while studying species interactions and the human-wildlife interface. I conclude with a few undeveloped questions about our conceptions of the pristine and tentatively ask if it is even possible to envision a more predictive historical ecology.

Tropical coral reefs are the canaries of climate change. Ocean warming events associated with a changing climate have resulted in sudden mass mortalities of coral from reefs across the world, triggering ecosystem declines from which recovery is protracted, if it has not completely stalled.[10] In the wake of these climate change events, a depressingly familiar ecological narrative has begun to emerge from reefs around the world. The natural buffer capacity of reef systems has come apart under the unrelenting influence of fishing pressure. With functionally critical herbivores fished out of most developing world reefs, when subjected to coral mass mortality, these reefs are soon taken over by macroalgae. These macroalgae pre-empt space on the reef benthos and prevent coral from recovering. Several decades after the initial coral decline, many reefs have shown very little recovery.[11]

This universal narrative does not quite fit the Lakshadweep reef system. I began monitoring its reefs in 1998, in the wake of one of the worst El Niño Southern Oscillation (ENSO) events to have affected tropical reefs in recorded history. I recorded a catastrophic die-back of coral across the archipelago in 1998, and have been tracking these reefs ever since. What emerges from this long-term monitoring is a far more complex picture of reef responses to climate change events with reefs following at least three qualitatively different ecological trajectories after these mass die-offs. The mechanisms underlying these trajectories are highly context specific, driven by coral recruitment, herbivore numbers, the architectural stability of the benthos and hydrodynamic patterns.[12]

What is interesting about the ecology of the Lakshadweep is the unexpected resilience it apparently shows in the face of potentially catastrophic events. This is particularly surprising given the fact that the Lakshadweep is among the most densely populated parts of rural India with fishing as an economic mainstay. However, what separates the Lakshadweep from many other tropical reef systems is that, despite this large population density, the reefs continue (until recently) to have a very low fishing pressure, making them as close to pristine as is possible to be in human-inhabited island systems.

This was not always the case. Prior to the 1970s, reef fishing was the dominant fishery on the islands, geared largely to meet local requirements. This changed dramatically with the advent of an experimental fisheries development programme conducted by the Fisheries Department to harvest pelagic tuna using a pole-and-line method that fishers in other oceanic islands had been using. This proved to be hugely successful and has weaned fishers off the reef; until today, tuna fishing is the primary fishing practice on the island.[13] The epiphenomenal upshot of this experiment is that the reefs today have considerably higher resilience than similar reefs across the tropics.

What is critical for our discussion is that if it were not for this single contingent event, the reefs of the Lakshadweep would potentially have had a profoundly different ecology – one that fits much more closely with the common narrative of unravelling ecological interactions being documented in other reefs. It is impossible to make sense of the current ecology of the Lakshadweep except through the lens of its historical influences.

What the Lakshadweep reefs show is that a single external event can take ecosystems down very different ecological trajectories. However, historical contingencies more often play themselves out as a series of small events which together amount to large and irreversible consequences for the system. This is essentially what happened with trawl fishing along Indian coastlines. Like the tuna fishery in the Lakshadweep, trawling was introduced as part of a governmental scheme (with the help of the Norwegian government and the FAO) to boost fishery production in coastal waters in the 1960s. The international demand for shrimp fuelled a dramatic rise in this industry, and a rapid overharvesting of the benthos.[14]

Since then, however, fishing practices along this coast have been

10. T.P. Hughes, et al., 'Climate Change, Human Impacts, and the Resilience of Coral Reefs', *Science* 301, 2003, pp. 929-933.

11. N.A.J. Graham, S. Jennings, M.A. MacNeil, D. Mouillot and S. K. Wilson, 'Predicting Climate-Driven Regime Shifts Versus Rebound Potential in Coral Reefs', *Nature*, 2015, pp. 1-17.

12. R. Arthur, T. J. Done, H. Marsh and V. Harriott. 'Local Processes Strongly Influence Post-Bleaching Benthic Recovery in the Lakshadweep Islands', *Coral Reefs* 25, 2006, pp. 427-440.

13. R. Arthur, Patterns and Processes of Reef Recovery and Human Resource Use in the Lakshadweep Islands, Indian Ocean. School of Tropical Environment Studies and Geography, James Cook University, 15 April 2005.

characterized by a dynamic and constantly evolving relationship between the ecological resource, fishing communities and a changing marketplace. The fishery can be seen as an uninterrupted serial depletion of fishery stocks as first shrimp, then squid, then shark, and finally a decaying cornucopia of mixed benthic species are hauled in to keep the industry alive.

Our work shows that fishery is no longer sustained by feeding human demand for fish, but to supply a growing poultry industry with chickenfeed.[15] This reduction fishery is high volume, low income, and ecologically disastrous. On the face of it, it is difficult to make sense of the fishery at all, or understand why and how it continues to persist in the face of declining target catches and profits. It is only when we re-imagine the fishery as a coupled system where local fishers are interactively adapting to a constantly changing ecological baseline and new market opportunities that the rampant overfishing of the East Coast makes sense.

The idea that historical contingencies can strongly mediate the trajectories that natural ecosystems take is neither new nor particularly surprising. What is a greater surprise is the dogged blindness of conservation science in light of the self-evident. As the field aspires to move away from the culture of ecological just-so stories towards a more conceptually appealing goal of unearthing transcendent principles of ecological structure and functioning, the field of ecology has had to necessarily ignore the inconvenience of historical contingency when constructing its theoretical models of how the world works. And while this construction is perfectly valid within the framework of a well defined ecological research programme, when carried over as an ideological position to conservation action, it can have unintended consequences, often borne by the ecosystem itself.

Sea turtles have been charismatic flagships for marine conservation. According to estimates by Jeremy Jackson, current estimates of green turtle populations in the world's oceans is a tiny fraction of what it was in pre-Columbian times, and they have succumbed to the combined pressures of overharvesting and habitat degradation.[16] In the last several decades, there have been concerted global efforts to protect and enhance their populations with a raft of management measures including the establishment of rookeries, protection of nesting beaches and the reduction of fishing bycatch. The green turtle is today emblematic of what can be achieved with concerted conservation efforts. While nowhere near the pristine densities estimated by Jackson, green turtle numbers are on the rise in several locations in the Indian Ocean, the Pacific and the Atlantic.[17] The Lakshadweep is one of these locations where, over the last two decades, there has been a dramatic increase in green turtle numbers, among the highest recorded anywhere.

Green turtles are herbivores and they depend primarily on seagrass for their forage. In the Lakshadweep islands, we first encountered the green turtle as the antagonist in a bitter conflict with local fishers that used the seagrass meadows to fish. Their claim was that green turtle population increases had precipitated a major decline in their fish catch from the lagoon. In examining the ecological underpinnings of this conflict we found that green turtles were indeed at very high densities and, at these numbers, were significantly overgrazing seagrass meadows causing major changes to growth rates and productivity patterns, resulting in major shifts in the species composition of seagrass, and eventually, to meadow decline.[18] This naturally led to significantly lower fish recruits and adult fish using the meadows. Fishers fishing in meadows occupied by turtles had fish catch values an order of magnitude lower than when turtles were absent.[19] What, on the face of it, looked like a major conservation success had a string of unintended consequences, leading to significant conflict with local communities and ecosystem decline.

14. A.S. Lobo and R. Arthur, 'Trawling the Shorelines: Fished Out and Squandered', in M. Rangarajan, M.D. Madhusudan and G. Shahabuddin (eds.), *Nature Without Borders*. Orient Blackswan, New Delhi, 2014. pp. 41-57.

15. A. Lobo, A. Balmford and R. Arthur, Commercializing Bycatch can Push a Fishery Beyond Economic Extinction. Conservation Letters, 2010.

16. J.B.C. Jackson, 'Historical Overfishing and the Recent Collapse of Coastal Ecosystems', *Science* 293, 2001, pp. 629-637.

17. A.C. Broderick, R. Frauenstein, F. Glen, G.C. Hays, A.L. Jackso, T. Pelembe, G.D. Ruxton and B. J. Godley, 'Are Green Turtles Globally Endangered?' *Global Ecology and Biogeography* 15(1), 2006, pp. 21-26.

18. A. Lal, R. Arthur, N. Marbà, A. W. T. Lill and T. Alcoverro, 'Implications of Conserving an Ecosystem Modifier: Increasing Green Turtle (Chelonia mydas) Densities Substantially Alters Seagrass Meadows', *Biological Conservation* 143, 2010, pp. 2730-2738; N. Kelkar, R. Arthur, N. Marbà and T. Alcoverro, 'Green Turtle Herbivory Dominates the Fate of Seagrass Primary Production in the Lakshadweep Islands (Indian Ocean)', *Marine Ecology Progress Series* 485, 2013a , pp. 235-243; N. Kelkar, R. Arthur, N. Marbà and T. Alcoverro, 'Greener Pastures? High Density Feeding Aggregations of Green Turtles Precipitate Species Shifts in Seagrass Meadows', *Journal of Ecology* 101, 2013b , pp. 1158-1168.

19. R. Arthur, N. Kelkar, T. Alcoverro and M. D. Madhusudan, 'Complex Ecological Pathways Underlie Perceptions of Conflict Between Green Turtles and Fishers in the Lakshadweep Islands', *Biological Conservation* 167, 2013, pp. 25-34.

This case study presents a compelling paradox about our conceptions of the pristine. At its most basic, it calls into question the past population estimates of large marine megafauna: could Eden have adequately supported and fed the numbers purported to have been in the Garden, or would they, quite literally, have eaten themselves out of house and home? If these populations are indeed representative of pristine numbers, it raises even more complex questions of what a pristine seagrass ecosystem would have looked like. While working towards an ecology of Eden, it is clear that there are inherent contradictions in our Edenic constructions: an Eden for turtles may not be an Eden for seagrass meadows, and certainly not for the people having to share the meadow with turtles.

What would it mean to include historical contingency as an endogenous driving factor of ecosystems? At its most fundamental, it would perhaps require us to accept that ecology, like evolutionary biology, is for the most part an inherently historical science. This is not to claim that universal principles of ecology do not exist,[20] but that this may require a loosening of the boundaries of that universality and an acceptance that, if a Grand Unified Theory of ecology exists, it is unlikely to be housed under a single equation but may, more realistically be a fairly large family of equations, the choice of which is highly dependent on contingent situations and historical influences. They become predictable only insofar as these historical influences or contingencies are predictable.

Whether it is possible to engage with a more predictive historical ecology is perhaps stretching a very long bow. It may be possible, for instance, to conceive of a set of environmental, geographical, cultural and ecological parameters that together predispose ecosystems to certain historical processes. If this were true, an ecological research programme would include an attempt understand these predispositions, and to fit them into a quasi-testable framework. While it is difficult to conceive what such a research programme would resemble, it would most likely be designed around replicated comparisons between locations that vary in a single driving factor examining the evidence for convergent or divergent histories at these locations. Within this agenda, ecologists would necessarily have to adopt a slightly more post-modern construction of their field, allowing for the idea that there most likely exist several potential ecologies associated with any given ecosystem.

A reprise of the story of the green turtles may provide the first hint that this predictive ecology has some merit. What we have documented from the Lakshadweep is now being replicated in several of the world's seas. In the seagrass meadows of Borneo, the Bahamas, Mayotte Island and Australia, a remarkably similar story to the Lakshadweep is being played out. The global conservation success for green turtles is resulting in potentially disastrous consequences for these seagrass meadows, leading in some extreme cases, of green turtles devastating seagrass meadows beyond thresholds of recovery.[21]

Finally, even if the idea of a formal induction of history into the proper study of ecology is a bridge too far, it still makes sense to view our ecosystems through the lens of human historical use. The high transcendent ideal of 'pure ecology', when translated into conservation, works on the assumption that the pristine state is something that is both desirable and achievable. There is very little reason to believe that either is true. The turtle case study underscores the hubris of desirability – the unintended consequences of returning to the pristine can often be worse for ecosystems and their function than we imagine.

An alternative approach requires surrendering one of the central articles of faith of conservation ecology – that there exists 'out there' an ideal ecosystem state for managers to aspire to, a state that, in most conservation narratives, existed in a past before humans fell from ecological grace. This nostalgic hankering for a pristine baseline that is in itself dubious in construction, may blinker us from seeing ecosystems as they likely have always been, at least within human timescales – messy, highly stochastic and prone to inevitable surprises and historical accidents.

A less ambitious ecological research programme would focus not so much on how ideal systems (that may represent less than 1% of the world's extant ecosystems) function, but on what is achievable within the untidy coupled human-ecological systems that dominate the globe today. While much less grand in its scope, a conservation ecology built on these principles would, I suspect, advance the cause of conservation much more. It would mean trading in the search for transcendent ecological principles for a more modest, but considerably more pragmatic blue-collar goal of providing a toolbox to sustainably manage the functioning of real world ecosystems.

20. J. Lawton, 1999, op. cit., fn. 4.

21. M.J.A. Christianen, et al. 'Habitat Collapse Due to Overgrazing Threatens Turtle Conservation in Marine Protected Areas.' Proceedings of the Royal Society of London. Series B: *Biological Sciences* 281, 2014, 20132890-20132890; M.R. Heithaus, et al., 'Seagrasses in the Age of Sea Turtle Conservation and Shark Overfishing', *Frontiers in Marine Science* 1, 2014, pp. 1-6.

Colonizing the poles

DAG AVANGO, PER HÖGSELIUS and HANNA VIKSTRÖM

'The first wave exploited tundra resources during the climatic optimum at a time when the conditions were warmer than today and much new land had been exposed by retreating ice conditions.'

'The Arctic region is now more accessible due to the Arctic melt. As a result, Arctic nations seem to be rushing to claim undeveloped and, in some cases, unseen territory and natural resources possibly worth hundreds of billions of dollars.'

THE above quotes aim to describe and explain two periods of change in the Arctic – the arrival of the first settlers in Arctic North America and Greenland and the more recent arrival of oil and gas companies interested in the fossil fuels buried under Arctic continental shelves. Thousands of years separate the two contexts, but the dynamics of change are portrayed in a similar way: actors move into the Arctic as a consequence of a changing climate. There are many similar examples from publications on Arctic history, ranging from explanations of the emergence of the so-called Thule culture and Norse settlements on Greenland a thousand years ago to the growth and decline of the whaling industry centuries later.

In this article which discusses the role of climate change in histories of Arctic colonization, we question the notion that climate change is a major driver of such processes. We will argue that colonization in the Arctic must be understood as a consequence of a complex set of factors, climate and environmental change being only one and, most often, of only minor importance.

When the geographers Terrence Armstrong, George Rogers and Graham Rowley (1978) and David Sugden (1982) published their classic works on the Arctic (and Antarctic), they summarized much of the archaeological and historical research that was available at the time on why humans decided to settle in the Arctic. Since then scholars within history and archaeology have deepened our knowledge on how and why this region has been colonized and re-colonized over thousands of years. Although new perspectives have emerged, climate change still stands out as a very strong factor in explanations of Arctic historical change.

A good example are explanations of the arrival of the first settlers in the far north – by western scholars called the 'Paleo-Arctic' – who moved into the north-eastern parts of present day Siberia and Beringia around 29,000 BC and used the area until 5000 BC. During the same period groups of settlers established themselves in the Arctic parts of present day Fennoscandia. Just as elsewhere in the world at the time, they lived by hunting and gathering. Most archaeologists have explained their appearance on the Arctic scene as a consequence of the retreating ice sheets of the last ice age during a climate optimum which left new lands open for utilization by humans.

The second big surge in human settlement of the Arctic took place from 2500-100 BC, when peoples associated with what archaeologists have called the Arctic small tool tradition left north-eastern Siberia and settled across Arctic North America, from the Bering Strait and eastward, eventually settling the western coast of Greenland. Over time they developed different lifestyles, as expressed by differing material cultures, settlement patterns and economies ranging from caribou hunting and fishing to whaling and sealing. Just as in the case of the Paleo-Arctic, researchers have argued that these actors settled and changed as a consequence of climate change. The diversification of the Arctic small tool tradition into regional cultures, the argument goes, was triggered by a cooling climate that stimulated local adaptions such as the Dorset culture with its ice based seal hunting and snow igloos.

The third large change took place only 1000 years ago, when the Thule culture spread rapidly from the straits off northern North America and on Greenland, reshaping previous lifestyles in these areas. The Thule settlements were mostly in coastal locations and their economy based on whaling from Umiaks and Kayaks. The emergence of this culture has been explained as a result of migration of whale populations, again triggered by climate change: a warmer climate allowed bowhead whales to pass through the straits north of North America, giving rise to the importance of whaling in the Thule economy.

Finally, environmental factors have been used to explain a fourth colonization in the Arctic – the Norse colonization of south-western Greenland in the 10th century AD, in which people from Iceland under the leadership of Eirik the Red established two settlement areas in the south-western part of this huge island. Archaeologists have estimated that in 1100 AD, the population in these settlements consisted of 6000 people, 280 farms, four churches and a cathedral. From the 14th century, however, the Norse settlements came to a rather rapid end. Researchers have pointed out several factors to explain this rather dramatic historical trajectory, one of them being climate and environmental changes. The establishment of the Norse settlements took place during a warmer period, which meant that the fiords and seas of Greenland became ice free and, therefore, easy to navigate. The warmer climate, supposedly, also favoured a longer growing season for crops, a longer period under which livestock could be kept outdoors and an abundance of fish. The decline of the settlement would have been caused by a colder climate from the 14th century, unfavourably affecting agriculture and livestock.

Thus, archaeologists and historians have tended to put a particular emphasis on environmental factors in their explanations of human colonization of the Arctic during the Holocene. This tendency, we argue, is a result of the paradigm of processual archaeology – a broader trend which dominated the discipline from the 1960s into the late 1980s – where environmental factors were prominent in explanations of change. When a major change in the archeological record coincided with an environmental change, the former was interpreted as a result of the latter. The idea of so-called 'pre-historic' cultures as 'adaptive' was an integrated part of this thinking – when the environment changed, people 'adapted'.

From the 1980s, however, an increasing number of archaeological scholars have called this environmental determinism into question, arguing that humans experience and deal with climate and environmental change through the filter of cultural norms and in relation to social strategies. Humans change their lifestyles and economies in accordance with such norms and strategies, whether the climate is changing or not. Inspired by this post-processual paradigm in archaeology, scholars studying historical change in the Arctic have shifted attention to other drivers of change, such as social, cultural, economic and political factors,

along with the role of processes of change outside of the Arctic. New interpretations open up as a result.

For instance, the early Paleo-Arctic settlers would have had generations of experience from living off the tundra of ice age Eurasia and would not have considered the Arctic as being any different. Later on, as their descendants moved into the lands of Arctic North America and Greenland, changing ideas and culture may very well have been the main reason, that is, cultures promoting the exploration of new land and new resources. Already in 1982, David Sugden pointed to such factors because of the rapidity of change and continuity of Arctic settlements.

In explanations of the rise and fall of the Norse settlements in Greenland, researchers have always considered a much wider array of factors than the environmental. The Norse settlements were partly living off trade with Europe, selling furs, ropes and ivory from walrus, as well as wool, polar bear skins and Greenland falcons. When new supply areas for such products opened up for European traders, the Greenland Norse could not compete. This would partially explain their decision to abandon their settlements. The difference in explanation is interesting. Partly it is a result of the fact that there are more written sources available regarding the Norse settlements and their trade. However, in line with Bruce Trigger's classical work on the history of ideas in archaeology, it reflects a bias among European scholars to view indigenous societies as passive, changing only as a result of external pressures to adapt to new environment, unwilling if not unable to change in accordance with new ideologies and social strategies.

Most scholars place the beginning of the Anthropocene in the 19th century, when Europe and North America went through a rapid process of industrialization, with associated natural resource exploitation on an unprecedented scale, reshaping the earth and its ecosystems. In the Arctic, Europeans had started extracting resources already in the 1600s through whaling.

The whaling companies harvested whale populations at Spitsbergen, Jan Mayen and Greenland. They hunted whales in the fiords and coastal seas and produced whale oil at onshore stations. Towards the end of the 1600s, they changed their strategy, abandoned their stations and instead hunted whale in the open seas and produced blubber in European ports after the end of the hunting season. Although historians have pointed out a variety of factors in explanations of this growth and decline of whaling, climate change have stood out as one of the prominent ones. The whalers established themselves at Spitsbergen at a time when the climate in the northern hemisphere was comparatively mild, providing access to fiords and hunting grounds. The time when they abandoned Spitsbergen for the open seas coincided with the beginning of the Little Ice Age, which left the sea ice in the fiords of Spitsbergen frozen through the summer.

Although climatic conditions may have influenced the strategies of the whaling companies, we argue that the colonization of the Arctic during this era must be understood in the broader context of the growth of European colonialism across the globe. Actors from Europe started a quest for precious metals such as silver and gold in the Americas and set up monopolies to secure exclusive opportunities to profit from trade. The whaling grounds of the Arctic were discovered in conjunction with attempts of European powers to find new shorter trading routes between Europe and Asia via the Northeast and Northwest Passages. The idea to harvest those whale populations was not much different from the idea to take possession over resources elsewhere in the world during this period.

From the mid-19th century, the mining industry also found its way to the Arctic on a grand scale. In Arctic Scandinavia, companies from the south had set up mining operations already in the 17th century, but operations on a larger scale were started as a result of the huge demand for metals during the Industrial Revolution – Malmberget in the 1880s and Kiruna in 1900. In Greenland companies mined cryolite, copper, lead and zinc from the mid-1800s. Gold mining commenced in Arctic North America – first by placer miners and later by larger companies – from the 1890s. At Spitsbergen, mining companies started up large-scale coal mines from 1905. This second wave of resource exploitation did not take place during a period of climate change for the warmer. Quite to the contrary, the Little Ice Age meant that the climate was still in a state of cooling since almost 200 years back. Nevertheless, the boom took place and to explain why, we need to understand it within the broader context of the Industrial Revolution which was transforming European and North American economies at the time.

Industrialization resulted in an unprecedented demand for metals and energy resources and thereby it also changed the character of colonialism as European capitalists turned their eyes to the rest of the world for lands and resources needed in their growing industries – rubber and copper from southern Africa, petroleum from the East Indies, bauxite from the Caribbean, and so on. The Arctic was no exception to this trend; it was just another example of it. Economic

actors in the growing industrializing economies connected Arctic geologies to larger production systems outside of the Arctic – cryolite mines in Greenland for aluminium production in Western Europe and North America, iron ore in Kiruna in Sápmi for the Swedish and European steel industries and coal mines at Spitsbergen for energy markets in Scandinavia and northwestern Russia. In some cases global geopolitics underpinned industrial colonization, such as Sweden and Norway supporting mining companies in Spitsbergen in order to influence the future legal status of the archipelago and ultimately their position in international relations. Similarly, when companies operating in the Arctic eventually closed operations, they did so for economic and in some cases also geopolitical reasons, not because of any changes in the climate.

Starting in the 1960s through the early 1980s, oil and gas companies moved into the Arctic, in a period when the climate was colder than during the preceding decades. This development was a result of changes in the international energy supply, triggered by a period of global turmoil associated with decolonization, including a whole range of key resource supplying regions. Oil and gas demand grew at a tremendous pace and as the most easily accessible deposits were depleted, oil explorers pushed the frontier into less accessible places like deserts, jungles, deep seas and into the frozen lands of the far north. The oil and gas actors saw the Arctic as a promising land partly because there were no guerilla wars, terrorism, or sudden nationalizations to be feared. Higher energy prices stimulated the development of new technologies that solved ice-related problems.

The most recent surge of interest in Arctic resources started off in the early 2000s, this time in a context of anthropogenic climate change and a wide debate within science and media, which projected a future in which the Arctic Ocean would be free from ice in the summertime in a not too distant future. Climate change and its impacts cannot explain the resource boom that unfolded, however. The boom was triggered by high prices on energy resources and minerals on global markets. Politics also played a role. In Greenland – as well as in a range of other, non-Arctic regions from Scotland to South Sudan – actors viewed their mineral and energy resources as a source of income on which to build a possible political independence. In Russia – but also in China – internal political prestige is clearly another factor behind governmental support to Arctic development. The Arctic programmes of China and Russia can here be seen in the same political context as the space exploration programs of these countries.

The climate in the Arctic keeps getting warmer, but the heat in the recent resource boom has all but ended. Large scale mining projects such as the Isua mine in Greenland or the Kaunisvaara mine at Pajala in Arctic Sweden are closing down. Investments in prospecting and exploration decrease at a rapid pace and energy extracting companies turn their interest to new possibilities such as fracking. Retreating sea ice does not make much difference when global fuel and ore prices fall.

In this article, based on examples from the distant past to the present, we have argued that human colonization of the Arctic cannot be explained persuasively by climate change. If this is true, why has this narrative become so dominant in the recent debate about the future of the Arctic? To answer this question we need to consider the general notion of what the Arctic is – a cold, inhospitable and very distant place, conditions that would discourage most people from not only going but also investing there. For this reason, actors with an interest to colonize and utilize resources there have had to produce narratives that could convince others of the feasibility of their projects, that is, rhetoric about the Arctic as a hospitable region.

Such narrative strategies have a long history. When Eirik the Red convinced fellow Icelanders to follow him to colonize the Arctic in the late 10th century AD, he did so by naming his new lands 'Greenland'. In that way he hoped to make them sound more attractive for settlement (a method that apparently worked). In the early 20th century, the Arctic scientist and visionary Vilhjálmur Stefánsson argued along the same lines – the Arctic was friendly and, therefore, a place to further colonize and utilize for resource extraction.

Mining companies at the time were arguing along the same lines – Spitsbergen was not far and not too cold, but relatively near and with a climate warmed by the Gulf Stream, a place where it was perfectly feasible to conductive mining at a profit. During the most recent Arctic resource boom, extractive industries and their supporters produced similar rhetoric, this time motivated by their conviction that Arctic resources should be utilized and an ambition to convince investors, political decision makers and the general public that resource extraction there is feasible and desirable – and indeed unstoppable.

There is no doubt that the Arctic environment has always posed a challenge to actors who have wished to colonize it and utilize its mineral and living marine resources, but it is equally clear that actors have been able to

deal with those challenges by developing the necessary technologies and lifestyles. Paleo-Arctic and subsequent settlers in Arctic North America, Greenland and Eurasia in the distant past, developed sophisticated technologies and life strategies with which they enabled themselves to cope with whatever local conditions they encountered.

The early modern whalers experienced the start of the Little Ice Age and no doubt encounters with more and more severe ice conditions, but dealt with it by developing pelagic whaling instead of shore station based technology. The oil, gas and mining companies of the 20th century found other ways of dealing with sea ice and the challenges of the Arctic environment, using new technology such as cargo ships that could cope with the ice, transport systems that remained functional in thick snow cover, local energy production, communities that could attract skilled personnel and promote social peace and drilling platforms that would just turn around with the surrounding ice floes.

Thus, the idea of climate change as a driver of human settlement and utilization of the polar regions is fundamentally flawed. When applied to indigenous societies it is an explanation echoing ideas that indigenous societies and cultures are bound by the state of their natural environments, destined to remain as they are unless the climate force them to 'adapt'. It is also a narrative that produces an image of a predetermined future, where our only choice is to accept that climate change will bring resource extraction to the Arctic in the future and that the only thing we can do is to mitigate its consequences. In this way environmental determinism depoliticizes an issue that should be determined by politics: whether or not an industrial future for the Arctic is really desirable.

Expanding the conservation landscape

T.R. SHANKAR RAMAN

THREE boundaries are becoming increasingly blurred in India's conservation and development landscape. A boundary in space that separates protected wildlife reserves and government owned or private forests from the surrounding areas under other human land uses. A boundary in time that demarcates historical landscape transformation or protection from earlier pristine or later recovery periods. And a boundary in the imagination that cleaves the human as a being separate from nature. Taken together, this calls for new approaches to conservation of biological diversity and spaces for people in conservation.

The Indian experience carries lessons for the wider developed world, especially for countries rich in biological diversity that are undergoing major shifts in demography and economy. Attested by recent scholarship and field research, it suggests a perspective that builds on environmental history and expands the contemporary conservation landscape to encompass the city, the countryside, and the wild.

Environmental histories, especially long perspectives emerging from deep histories of wide landscapes, partly impel this broadening of the conservation landscape.[1] Globally, few would argue that we now live in a period, labelled the Anthropocene, of unprecedented human impact including landscape alteration, global climate change, and species extinction. Still, environmental histories reveal pervasive historical and cultural connections and dynamics of humans and landscapes. If this deep history of ecological and cultural continuity and change is ignored, mainstream conser-

1. M. Rangarajan and K. Sivaramakrishnan, *Shifting Ground: People, Animals and Mobility in India's Environmental History*. Oxford University Press, New Delhi, 2014.

vation efforts – such as setting aside protected reserves or restricting human impacts – risk pursuing misdirected or inadequate conservation goals.

Under the long shadow of history amidst widespread global change, the conservation movement's quest for the 'pristine' or for nature uninfluenced by humans may prove elusive. At the same time, recent ecological field research reveals gradations and nuances of human influence on biological diversity, ranging from the negative and neutral to the positive and resuscitative, from destruction and degradation to recovery and restoration. Approaches that integrate environmental history with contemporary ecology, which reaffirm and reorient the human place in nature, can better guide, revive, and sustain conservation landscapes of the future.

The setting aside of natural remnants and reserves as a means of conservation has, of course, a long history in India, emerging bottom-up as traditional and community reserves as well as imposed top-down by ruler or state as more exclusive reserves.[2] Connected to a rooted conservation ethic, local knowledge of nature and natural resources, and tolerance, communities across India have established, protected, and managed sacred groves, wetland heronries, and village commons such as pastures and bamboo reserves. In contrast, the top-down reservation effected by state fiat or legislation resulted in the creation of reserves such as the hunting preserves of the erstwhile princely states, forest reserves of the colonial British government, and wildlife reserves in independent India. After the enactment of the Wildlife Protection Act in 1972, a slew of reserves were established as wildlife sanctuaries, national parks, and tiger reserves, together numbering over 660 in 2015 and occupying just under 5% of the country's geographical area.

Although useful, the bottom-up versus top-down classification is a simplistic portrayal of the diversity of conservation approaches and their social, ecological, and historical contexts. The latter sometimes built upon the former as in the case of Vedanthangal bird sanctuary in South India, or as in the more recent attempts to notify community reserves under the Wildlife Protection Act, and recognize the roles and rights of forest dwellers in forest conservation under the Forest Rights Act of 2006. Still, the setting aside of protected reserves has been a mainstream conservation approach for long.

The creation of wildlife reserves in India has paralleled the setting aside, worldwide, of over 209,000 protected areas that now cover about one-sixth of earth's terrestrial area and inland water, and 3.4% of the oceans.[3] Following the creation of protected areas, the last decades of the 20th century saw debates over the conservation philosophies of preservationism versus sustainable use, recalling similar debates of earlier decades.[4] The protected areas sometimes became theatres of contest between excluded or dispossessed local communities and state or industrial interests.

While these debates brought the realities, nuances, and complexities of conservation to the forefront and continue to remain relevant, there is now greater recognition that a diverse suite of conservation, governance, and management systems is required rather than a preservation versus use dichotomy. The IUCN spectrum of protected areas ranging from Strict Nature Reserve and Wilderness Area (Category Ia and Ib) to Protected Area with Sustainable Use of Natural Resources (Category VI) is one such articulation. Another is India's attempt to establish 'inviolate areas' free of human influence in national parks and tiger reserves, recognize rights and uses of forest dwellers in reserved forests and wildlife sanctuaries, and create community reserves and joint forest management (JFM) systems.

Irrespective of the conservation philosophy, approach, or management system, the creation of protected areas for conservation has left open three broad questions. All three are of great relevance in the current context. First, are protected areas enough? In an increasingly transformed and crowded world, where reserves are few, scattered amidst other land uses, and small (>58% of protected areas are less than 10 square kilometres in area), can conservation goals be achieved by such reserves alone? Should conservation efforts encompass the diversity of species that persist in or use the surrounding landscapes? In other words, should there be greater efforts to expand the penumbra of places for nature conservation?

Second, what is the role for rewilding and restoration, especially in areas set aside ostensibly to minimize human impacts? These often active tasks of intensive human intervention may be needed to bring back original ecosystems and complement of species that were lost or altered due to historical exploitation, land use, or degradation. In considering environmental history, how far back in time should one look to determine the original or desired state and benchmark recovery?

2. V. Saberwal, M. Rangarajan and A. Kothari, *People, Parks and Wildlife: Towards Coexistence*. Orient Longman, New Delhi, 2001.

3. See http://www.protectedplanet.net and http://www.mpatlas.org/

4. D. Worster, *Nature's Economy: A History of Ecological Ideas* (2nd edition). Cambridge University Press, Cambridge, 1994.

Third, can humans live alongside other species, as a part of nature rather than live apart from nature? Will negative interactions between people and wildlife, in combination with reservation of conservation areas, lead to an increasing disconnect between humans and other species? How does one frame and manage interactions between people and wildlife to foster coexistence? Scholarship and field research on these three larger questions contribute to the blurring of the three lines in space, time, and imagination alluded to in the opening of this piece.

Conservation research across diverse landscapes in India and elsewhere in the tropics is firmly establishing the need to look beyond the boundaries of protected areas.[5] The effectiveness of protected areas to stave off conservation threats has been variable. One study of 93 protected areas across 22 tropical countries showed that protected areas have been reasonably successful in preventing further land clearing, but less effective with threats of hunting, logging, fire, and grazing.[6] Unprecedented infrastructure expansion, particularly roads, is now a serious concern in many tropical areas, implicated in deforestation outside and to a lesser extent within protected areas and in disruption of animal corridors.

A global survey of 60 tropical protected areas found that around half are continuing to lose biodiversity in a range of taxa from fish and amphibians to primates and carnivores.[7] Although such nature reserves may help reduce deforestation within their boundaries, the surrounding landscapes may continue to lose forest cover and undergo land use changes, with inimical effects that may penetrate the park and affect their connectivity to other reserves. To be effective, conservation within reserves must also take into account the needs of local communities, poverty and livelihoods, and unsustainable land-uses in the surrounding landscape.[8]

As recent works indicate, both species requirements and ecological processes dictate the need to consider wider landscapes. Species such as Asian elephants or migratory birds move over large areas thereby indicating the value of corridors and stopover sites and habitats *en route*. Ecological processes such as animal migration, flow of nutrients and pollution, large-scale phenomena such as synchronized bamboo flowering, and global changes such as a warming climate may connect even the most remote corner of protected areas with wider landscapes and changes. Many species of conservation interest persist in landscapes outside protected areas, including in areas such as wetlands, pastures, plantations and agroforestry, and cities.[9]

The creation or expansion of infrastructure such as roads, railways, canals, and powerlines within and around conservation areas, brings concerns related to wildlife mortality, habitat fragmentation, weed invasion, and degradation.[10] Emerging fields of study such as countryside biogeography, urban ecology, and road ecology integrate these areas and concerns under a broader conservation umbrella. While highlighting cross-sectoral political and policy linkages, they have also fostered cross-disciplinary links between humanities, social sciences, natural sciences, agriculture, and engineering technology. Besides expanding the conservation horizon from cities to wilderness, what is now evident is that drawing a boundary around an area to focus protection efforts within, by itself, is insufficient to attain conservation goals.

Taking the long view of environmental history also challenges some common concepts underlying mainstream conservation approaches.[11] This includes the concepts of pristine nature or 'climax' vegetation, sharp colonial ecological watersheds, and the narratives of loss set against putative historical baselines.[12] In tropical forests, for instance, archaeological, historical, and other scientific evidence points to a long history of human presence,

5. M. Rangarajan, M.D. Madhusudan and G. Shahabuddin (eds.), *Nature Without Borders*. Orient Blackswan, New Delhi, 2014.

6. A.G. Bruner, R.E. Gullison, R. E. Rice and G. A.B. da Fonseca, 'Effectiveness of Parks in Protecting Tropical Biodiversity', *Science* 291, 2001, pp. 125-128.

7. W.F. Laurance, D.C. Useche, J. Rendeiro, M. Kalka, C.A. Bradshaw et al., 'Averting Biodiversity Collapse in Tropical Forest Protected Areas', *Nature* 489, 2012, pp. 290-294.

8. See: R. DeFries, A. Hansen, A. C. Newton and M. C. Hansen, 'Increasing Isolation of Protected Areas in Tropical Forests Over the Past Twenty Years', *Ecological Applications* 15, 2005, pp. 19-26; L. Naughton-Treves, M. B. Holland and K. Brandon, 'The Role of Protected Areas in Conserving Biodiversity and Sustaining Local Livelihoods', *Annual Review of Environmental Resources* 30, 2005, pp. 219-252; and Laurance et al. 2012, op. cit.

9. See Introduction and Chapters by K.S.G. Sundar, 'Sarus Cranes, Cultivators and Conservation'; H. Nagendra, R. Sivaraman and S. Subramanya, 'Citizen Action and Lake Restoration in Bengaluru'; N.S. Ghotge and S.R. Ramdas, 'Black Sheep and Grey Wolves: Pastoralism in the Deccan'; and D. Mudappa, M. A. Kumar and T.R.S. Raman, 'Restoring Nature: Wildlife Conservation in Landscapes Fragmented by Plantation Crops in India', in Rangarajan et al., *Nature Without Borders*, op. cit., 2014.

10. T.R.S. Raman, 'Framing Ecologically Sound Policy on Linear Intrusions Affecting Wildlife Habitats.' Background paper for the National Board for Wildlife, Ministry of Environment and Forests, Government of India, 2011.

11. M. Rangarajan and K. Sivaramakrishnan, *Shifting Ground*, op. cit., 2014.

12. K.D. Morrison, Conceiving Ecology and Stopping the Clock: Narratives of Balance, Loss, and Degradation', in M. Rangarajan and K. Sivaramakrishnan, ibid., 2014, 39-64.

13. C.C. Mann, *1491: New Revelations of the Americas Before Columbus*. Second edition. Knopf, 2006.

use, and modification in India as elsewhere.[13] As Kathleen Morrison underscores through analysis of case studies, the rise and fall of empires such as at Vijayanagar in southern India, has dynamically altered the water bodies, pastures, fields, farms, and forests across large landscapes. Many areas considered pristine today have retained or recovered their biological diversity and characteristics over long periods alongside various forms of human influence.

The natural environments of today are therefore better construed in relation to the historical and contextual degree of human impact or influence rather than their complete absence. In Morrison's words, 'Like the "fall" and expulsion from the garden in romantic approaches, scientific approaches adopt the view of *human-modified natural environments*, original states of nature against which cultural action is arrayed. The long human history in South Asia, along with its changing climate, make it clear that there *could never have been* such a beginning, and that humans cannot be excised from histories of the landscape. Beyond this, many accounts of change, whether of environmental political, or social history, drink from the same metaphorical well, invoking common tropes of loss, degradation, and decay.'[14]

A more fluid conception of change and historical influence is applicable not only to contexts such as ecosystems in disequilibrium or affected by long-term climate change, or which are believed to represent trajectories of decline from pristine to degraded. Cyclic systems too may exist, such as in seasonally flooded environments or in shifting (swidden) agricultural landscapes. In parts of northeast India such as Mizoram, shifting agriculture or *jhum* cultivation creates and maintains a landscape mosaic of fields, fallows, and forests (both regenerating secondary and mature forests), with a significant presence and role of bamboo in regeneration.

Earlier research had suggested that if bamboo forests regenerating after jhum were protected for periods spanning decades, mature tropical evergreen forests are likely to recover after the periodic mass flowering and death of bamboos. Recent research suggests that after bamboo flowering, bamboo recovers and persists in the same sites, acting as a pervasive ecological and cultural marker of human influence in the landscape.[15]

These ideas are relevant in the context of the increased interest globally in ecological restoration of degraded ecosystems and rewilding areas with species and ecological functions.[16] Rewilding and restoration involve a bringing back of species to sites for which historical information on ecological conditions, species composition, and human influences play a major part. Knowledge of how ecosystems functioned prior to loss, and reference sites that have seen different histories and intensity of impact, can help determine and track trajectories of planned recovery. Still, such restoration remains difficult given the ongoing pace and extent of change, difficulties in determining how far back in history one would look to determine the original conditions, and the possibility that under present conditions the trajectory of recovery may depart significantly from the past. Historical knowledge and continuous monitoring may then serve more as guides rather than templates for restoration.[17]

Rewilding and restoration affirm a significant positive role for human influence in designing and tracking recovery towards more desirable ecological and cultural outcomes, even where target original conditions are not precisely determinable. Restoration goals therefore need to integrate both cultural and ecological continuity in the landscape. Sharp boundaries in time may need to make way for a more fluid conception of history and informed charting of progress into the future.

Species persistence outside protected areas, and restoration and rewilding efforts, may enhance interactions among people and wildlife in the landscape. Animal species often persist outside protected areas in habitat remnants and areas under more intensive human land use or production, as shown by recent studies of species such as elephants, leopards, and a spectrum of other wildlife.[18] The interactions between humans and wildlife may range from positive

14. Op. cit., fn. 12.

15. See: T.R.S. Raman, G.S. Rawat, and A.J.T. Johnsingh, 'Recovery of Tropical Rainforest Avifauna in Relation to Vegetation Succession Following Shifting Cultivation in Mizoram, North-East India', *Journal of Applied Ecology* 35, 1998, pp. 217-231; B. Ingle and T.R.S. Raman, unpublished data, 2015.

16. G. Monbiot, *Feral: Searching for Enchantment on the Frontiers of Rewilding.* Allen Lane, London, 2013.

17. K. Suding, E. Higgs, M. Palmer, J.B. Callicott et al., 'Committing to Ecological Restoration', *Science* 348, 2015, pp. 638-640.

18. See: V.R. Goswami, S. Sridhara, K. Medhi, A.C. Williams et al, 'Community-Managed Forests and Wildlife-Friendly Agriculture Play a Subsidiary but not Substitutive Role to Protected Areas for the Endangered Asian Elephant', *Biological Conservation* 177, 2014, pp. 74-81; M.D. Madhusudan, N. Sharma, R. Raghunath, N. Baskaran et al., 'Distribution, Relative Abundance, and Conservation Status of Asian Elephants in Karnataka, Southern India', *Biological Conservation* 187, 2015, pp. 34-40; V. Athreya, M. Odden, J.D.C. Linnell, J. Krishnaswamy and K. U. Karanth, 'Big Cats in our Backyards: Persistence of Large Carnivores in a Human Dominated Landscape in India', *PLoS ONE* 8(3), 2013, e57872; D. Mudappa, M.A. Kumar and T.R.S. Raman, op. cit., 2014.

(e.g., aesthetic appreciation, economic returns through use or tourism), through neutral (no noticeable human-wildlife impact) to negative (e.g., causing losses to property or livestock, human injuries and deaths).

To conserve other species that share landscapes with people requires proactive efforts to avoid or minimize negative interactions such as wildlife damage to crops and property, livestock depredation, and injury or loss of human life in (frequently accidental) encounters. This can enable human-wildlife coexistence involving many species, including carnivores such as lions, bears, cougars, and coyotes that live in or are expanding their ranges into human-use areas in many parts of the world. Well known in North America and Europe, such phenomena also apply to parts of South Asia for some large wildlife species.[19]

The presence of wildlife alongside people is often construed as a problem or as leading to human-wildlife conflicts. Although the term 'conflict' has been widely used in the literature, this has been criticized in a recent assessment.[20] The use of 'conflict' can be misleading as it conflates and confuses direct impacts of wildlife on humans with the often more frequent human-human conflicts such as between conservationists and developers who pursue alternate visions for the same area.

The focus on conservation within the bounds of nature reserves has also led to the idea that wildlife involved in negative interactions with people in the surrounding landscape are 'problem animals' that are 'straying' out from the domain of nature into the domain of the human. As a result of this perception, reactive measures that seek to continually separate animals from people through barriers, capture and removal into captivity, or translocation into protected areas, are implemented. Such measures have been shown to fail to address the cause of the negative interaction (which, in reality, may be a problem related to location, or to human welfare and occupational safety, rather than the animal itself), or to prevent recurrence, or actually transfer or worsen the problem (e.g., leopards[21]). Community involvement and proactive measures that address human needs such as safety and sanitation, insurance and early warning systems, and better livestock corrals and herding practices, offer better alternatives for coexistence.

The idea of coexistence of humans with other species finds space in contemporary policy as in the case of Asian elephants.[22] In 2012, the Karnataka Elephant Task Force demarcated three 'elephant management zones' for the state: elephant conservation zone, elephant-human coexistence zone, and elephant removal zone.[23] The three-way classification parallels the notion of 'sustainable landscapes',[24] construed as landscapes which have protected areas set aside for species conservation, use areas meant for sustainable natural resource extraction, and more intensive land use areas with agriculture and urbanization.

Although this three-way zonation refines the inadequate within/outside protected area classification, it is afflicted with the same problem of artificial boundaries that restrict neither humans nor animals. Given pervasive human presence and historical impact even inside parks and sanctuaries and the widespread occurrence of wildlife and biological diversity even in intensively used areas such as cities, this classification may be questioned. In reality, the entire spectrum from industrial and urbanized areas to countryside and wilderness can justifiably be viewed as a single wide landscape of coexistence.

Accommodating deep history and wide landscape perspectives into conservation also requires integrating ecological research with environmental history. While environmental historians are right to critique the quest for 'pristine' nature as flawed given the historical evidence,[25] they fall short in recognizing other ecological concerns. As field research across a cross-section of habitats in the landscape indicates, pervasive human influence does not imply that human influence is always benign or unavoidable. Studies

19. G. Chapron et al., 'Recovery of Large Carnivores in Europe's Modern Human-Dominated Landscapes', *Science* 346, 2014, pp. 1517-1519; V. Morrell, 'Predators in the 'Hood', *Science*, 341, 2013, pp. 1332-1335; and T.R.S. Raman, 'Leopard Landscapes: Coexisting With Carnivores in Countryside and City', *Economic and Political Weekly*, Web Exclusives, 3 January 2015, http://www.epw.in/reports-states/leopard-landscapes.html

20. S.M. Redpath, S. Bhatia and J. Young, 'Tilting at Wildlife: Reconsidering Human-Wildlife Conflict', *Oryx* 49, 2015, pp. 222-225.

21. V. Athreya, M. Odden, J.D.C. Linnell and K.U. Karanth, 'Translocation as a Tool for Mitigating Conflict With Leopards in Human-Dominated Landscapes of India', *Conservation Biology* 25, 2011, pp. 131-141; M. Odden, V. Athreya, S. Rattan and J.D.C. Linnell, 'Adaptable Neighbours: Movement Patterns of GPS-Collared Leopards in Human Dominated Landscapes in India', *PLoS ONE* 9(11), 2014, e112044.

22. M. Rangarajan, A. Desai, R. Sukumar, P.S. Easa et al., Gajah: Securing the Future for Elephants in India. Report of the Elephant Task Force, Ministry of Environment and Forests, Government of India, New Delhi, 2010.

23. Report of the Karnataka Elephant Task Force, submitted to Honourable High Court of Karnataka, September 2012.

24. J.G. Robinson, 'Limits to Caring: Sustainable Living and the Loss of Biodiversity', *Conservation Biology* 7, 1993, pp. 20-28.

25. K. Morrison, in M. Rangarajan and K. Sivaramakrishnan, *Shifting Ground*, op. cit., 2014.

show that various anthropogenic factors such as type of land use, extent of forest cover or fragmentation, degree or intensity of habitat alteration, and human population density can influence the diversity and abundance of species in the landscape. Species of greater significance for conservation, including those that are rare, have more restricted ranges, or have specialized habitat requirements, are known to occur more frequently in less intensively used or altered habitats such as old-growth or mature tropical forests.[26] For conservation to be effective across wide areas, it is often vital that such mature or less-impacted habitats are retained as part of the landscape mix.

Deep history also holds profound implications for restoration and rewilding. Ecosystems can rebound when freed of past human impacts, such as following land abandonment, human migrations, or even due to armed conflicts and wars, as evidenced in parts of Europe and the Americas. In other places, careful reintroduction of species, control or removal of invasive alien species, and various forms of habitat manipulation may be required for rewilding landscapes and waterscapes. Such active efforts, crucially involving human intervention and participation, may be required to return or recover species of conservation significance, ecological functions such as watershed values, besides aesthetic and other use values.[27] Evidence from environmental history, in this context, represents not merely a negation of the pristine, but serves as a guide to enhance ecological and cultural potential of a landscape with positive roles for humans in conservation.

In conclusion, stretching the conservation landscape to encompass much larger areas than the 5% of land area in India's wildlife protected areas represents both a great challenge and an opportunity. As scientists, practitioners, and communities continue to extend conservation beyond the boundaries of nature reserves into countryside and urban landscapes, more examples, approaches, and models of human-wildlife coexistence are being brought to the fore. Restoration and rewilding are also gaining ground as complementary conservation strategies. While a quest for a single or particular historical baseline or boundary may remain elusive, it is evident that various elements or habitats in the landscape differ in their potential to support conservation of nature and biological diversity. These elements of the landscape, which also differ in the intensity and history of habitat alteration or human influence, deserve to be included in the penumbra of places for conservation and restoration.

Attention to long-term environmental history, indicating diverse, shifting, and dynamic landscapes under human influence, can illuminate and guide such conservation and restoration efforts. Such a broadening of the ambit of conservation can potentially increase the spaces and constituencies for conservation through wider engagement of communities and the larger civil society, besides political and corporate entities.[28] At a fundamental level, this also requires recognizing humans as part of nature, enmeshed in its ecology, with agency and capacity to positively influence the future conservation landscape.

26. T. Newbold, L.N. Hudson, H.R.P. Phillips et al., 'A Global Model of the Response of Tropical and Sub-Tropical Forest Biodiversity to Anthropogenic Pressures', *Proceedings of the Royal Society B: Biological Sciences* 281, 2014, 20141371.

27. G. Monbiot, *Feral*, op. cit., 2013.

28. M. Rangarajan, M.D. Madhusudan and G. Shahabuddin, *Nature Without Borders*, op. cit., 2014.

Provincializing the anthropocene

KATHLEEN D. MORRISON

THE suggestion that we have entered a new geological era, the 'Anthropocene', an era in which humans for the first time must be counted as global agents, or drivers of change, cannot have escaped the attention of readers of *Seminar*. The assertion of a new form of agentive force for our species is subject to challenge in empirical terms, a point I discuss below. Evaluating the empirical sufficiency of the idea that significant human impact on the earth system is relatively recent is the subject of an ongoing research project to collate and commensurate historical, archaeological, and paleoenvironmental evidence regarding the actual contours of the global human footprint (that is, a data-based rather than model-based reconstruction). While empirical sufficiency is important, the form that the Anthropocene debate takes is also of interest.

In this essay, I discuss the somewhat hidden Eurocentrism of the Anthropocene concept. To a surprising extent, the notion of an Anthropocene – and much of the analytical apparatus surrounding it – represents an effort to expand (rather homogenized) European historical experiences, frameworks and chronologies onto the rest of the world. I take the term Eurocentrism here literally, in that existing mod-

els tend to 'build out' from Europe and from the temperate zones, taking other regions as variants on an unmarked category. Building out from European history has given the Anthropocene discourse a particular flavour, not only within the scientific community but also among those who have embraced the concept with the fervour of the converted, chiefly humanists for whom the idea of global anthropogenic agency is particularly new and exciting, and hard scientists who have finally managed to naturalize human social relations into determinative models.

I argue here that the concept of the Anthropocene is unnecessary – not because humans have not changed the earth, but because we have done so throughout the Holocene. But even beyond this, it is important to note that the concept hides a disturbing extension of colonial discourse into a post-colonial world.

The title of this essay is of course a homage to Dipesh Chakrabarty's *Provincializing Europe*, which seeks to dislodge European thought from the centre of the practice of history, using the study of South Asia as a vehicle for so doing.[1] Here I would suggest not only that European historical experiences and the imagined relationships these imply about human population, land use, and human impact on the geosphere need to be decentred in analyses of anthropogenic environmental change, but further that the apparent novelty of a 'geology of humans' to both science and the humanities is just that – apparent. Provincializing the Anthropocene means not only that we no longer take European agricultural or industrial history as a starting point, or that we stop trying to project (and retrodict) proposed causal relationships between population and anthropogenic effects derived from a limited sample of human economic history, but also that we attend to the ways in which existing 'western' structures of thought and disciplinary practice overdetermine modes of agency – 'human' and 'natural'.

Thus it is that those disciplines most enthusiastic about declaring an end to the Holocene, already the briefest geological period we know at ten thousand years, are those who, on the one hand, never before knew we were in it or, on the other, managed until now to analytically ignore or even erase human agency.

As parallel to Chakrabarty's work, I offer here an alternative. Historical, paleoenvironnmental and archaeological research in India, among other places, shows us some of the limits of models and time markers built on an European base, challenging both the form and substance of work which directly feeds in to global and local climate models and, as such, to science, policy, and disciplinary imaginations of the human place in the world. The poser to this issue contends that history matters for environmental issues in the present, an assertion true in at least two senses. First, it is empirically true. A rising tide of research is showing that humans have, in fact, been both biological and even geological agents for a very long time; even the vast Amazonian rainforests once iconic of 'pristine' nature have been shown to be products of regrowth.[2] This is a complex and variable history whose contours we must understand better, not only for their own sake, but for the present and the future.

History matters, too, in how we generate and understand evidence about human-environment interactions. Those of us in fields long dedicated to understanding such engagements know just how difficult it is to elude, for example, the fundamental nature-culture dichotomy that so pervades both thought and language. The Anthropocene debate, for all its empirical redundancy and European focus, may thus perhaps be in some ways a useful exercise after all. It has shown natural and physical scientists that humans can operate as more than simply 'external' disturbance factors to 'natural' processes, and humanists that they, too, may have a role to play in addressing the current environmental crisis.

Most proposals for an Anthropocene era adopt a rather limited historical perspective, assuming that significant environmental impact began only with the (European, and especially British) Industrial Revolution.[3] This can become a self-fulfilling prophecy; consider the evidence on land transformation by humans reviewed in Ramankutty and Foley[4] and Hook et al.[5] which cover only the last 300 years. While the significance of recent anthropogenic change is beyond doubt, what is less clear is how novel such change really is. By shutting out consideration of longer-term change, we foreclose the possibility that anthropo-

1. D. Chakrabarty, *Provincializing Europe*. Princeton University Press, Princeton, 2000.

2. S. Hecht, K.D. Morrison and C. Padoch (eds.), *The Social Lives of Forests: Past, Present, and Future of Woodland Resurgence*. University of Chicago Press, Chicago, 2014.

3. Jan Zalasiewicz, Mark Williams, Alan Smith, Tiffany L. Barry, Angela L. Coe, Paul R. Bown, Patrick Brenchley, et al., 'Are We Now Living in the Anthropocene?' *GSA Today*, 18(2), 2008, pp. 4-8. See Kidwell, 2015, for an overview of the debate over timing within the scientific community.

4. Navin Ramankutty and Jonathan A. Foley, 'Characterizing Patterns of Global Land Use: An Analysis of Global Croplands Data', *Global Biogeochemical Cycles* 12(4), 1998, pp. 667-685.

5. R. LeB. Hooke, J.F. Martin-Duque and J. Pedraza, 'Land Transformation by Humans: A Review', *GSA Today*, 22(12), December 2012, pp. 4-10.

genic change actually has a longer, more complex, or more variable trajectory than is generally assumed.

This issue is actually critical to the debate, since there is ample evidence to suggest that even in the absence of farming, humans sometimes drove vegetation change. For example, large-scale human burning has reshaped vegetation regimes from grasslands to prairies which were once thought to be entirely 'natural'. Agriculture, of course, is another major means by which our species has reshaped not only vegetation, but also soils, slopes, hydrology, disease environments, the distribution of wild plants and animals and has made possible new configurations of human population.

Indeed, it is the onset of agriculture that provides another magic number in Anthropocene discourse, 6,000. Around six thousand years ago, farming came to Britain, Ireland, and northern Europe, initiating a new mode of subsistence that would have far-reaching implications. What is curious about the climate community's interest in mid-Holocene transitions is not recognition of the significance of farming, however. It is the general acceptance of a date based on the rather late appearance of cultivation in what is arguably a small, remote, and unrepresentative part of the world to stand in more generally for the beginnings of agricultural impact. Elsewhere, farming is much earlier, more or less coincident with the onset of the Holocene, around 10,000 years ago.

In South America, Mesoamerica, Southwest Asia, South Asia, and East Asia, for example, we have ample archaeological evidence for early Holocene farming, a way of life that had significant implications for the non-human world. As farming diversified, some forms of cultivation, such as terraced hillsides and rice paddies reshaped landscapes in ways that rival those of a modern monocropped field. And many of these domesticated landscapes planted with rice, sugarcane, taro, and other crops are both widely distributed and temporally enduring. It is critical, therefore, to accurately assess the impact of not just 300, not just 6,000, but at least the last 10,000 years of human action on the earth.

The use of European and particularly northern European chronologies to periodize other parts of the globe is, of course, nothing new. India's basic historical framework of Ancient, Medieval and Modern periods is but a modest renovation of the colonial Buddhist, Hindu, Muslim and British periods. In archaeology, too, terms such as Palaeolithic, Mesolithic, Neolithic, and Chalcolithic are European imports, categories whose movement across the globe with colonial science and subsequent naturalization have left a legacy of awkward constructs designed to paper over the fact that these terms do not always capture local realities effectively. If the starting points and inflection points of the Anthropocene enthusiasts are oddly northern European, so too are some of the scientific procedures, which built out, quite literally, from European experiences. I take this up in the following section.

Climate models are complex entities whose predictive power is built on understandings of causal and processual relationships, such as those connecting atmospheric conditions and temperature. Atmospheric circulation, ocean circulation, and land surface relationships are all important parts of climate models; land surface relationships include vegetation as one factor affecting heat, moisture, and albedo, among other things. Vegetation or land cover, the 'living cloak' of the earth, thus plays a role in climate. Current models suffer, however, from an inability to model anthropogenic land cover change,[6] instead relying on simulations of climate-induced vegetation ('potential natural vegetation'). We know, however, that human land use has been an important factor – or 'driver' – of change and that 'potential natural vegetation' has not always been the same as actual vegetation.

One way that this deficit has been addressed is through modelling. What are generally referred to as ALCC (anthropogenic land cover change) models posit relationships between historic population levels (themselves based on extremely rough estimates from historical data) and human induced land cover change. Models of past anthropogenic land cover change[7] differ significantly from one another,[8] so it is worth looking at how they operate.

Given the difficulties of aggregating and commensurating evidence about actual historical changes in land use and land cover – an effort now finally underway[9] – ALCC models build from assumptions about the relationships between human population levels and their impact on vegetation. All models are simplifications, and my intention is

6. G. Strandberg et al., 'Regional Climate Model Simulations for Europe at 6 and 0.2 k BP: Sensitivity to Changes in Anthropogenic Deforestation', *Climate of the Past* 10, 2014, pp. 661-680.

7. K. Klein Goldewijk, A. Beusen, G. van Drecht and M. de Vos, 'The HYDE 3.1 Spatially Explicit Database of Human-Induced Global Land-Use Change Over the Past 12,000 Years', *Global Ecology and Biogeography* 20, 2011, pp. 73-86. Also, J.O. Kaplan, K.M. Krumhardt and N. Zimmermann, 'The Prehistoric and Preindustrial Deforestation of Europe', *Quaternary Science Reviews* 28(27-28), 2009, pp. 3016-3034.

8. M.J. Gaillard et al., 'Holocene Land-Cover Reconstructions for Studies on Land Cover-Climate Feedbacks', *Climate of the Past* 6: 2010, pp. 483-499.

9. http://www.pages-igbp.org/ini/wg/landcover6k/intro

not to critique the efforts of modellers who are, after all, making the best of a difficult situation. Still, the historical primacy of Europe finds resonance in the science itself as well as its temporal framing. The model developed by Jed Kaplan and colleagues,[10] for example, was initially based on a simulation of change for European vegetation over the last 3,000 years. As they explain in a later article,[11] 'We expanded on this method in the current study by expanding the geographic scope to global and the entire time period from 8000 years ago to AD 1850, when the Industrial Revolution began to profoundly alter relationships between population and land use.'[12]

The use of algorithms based on temperate farming required the authors to introduce a tropical correction factor (a 'potential productivity scaling') in order to compensate for what they saw as unrealistically high anthropogenic land cover change in the tropics the model otherwise predicted. The model thus takes Europe as kind of baseline in terms of population-land cover relationships and 'corrects' for other regions. One can hardly blame scholars for building out from better-known to lesser-known instances, and the fact that the archaeology, paleoecology, and history of Western Europe is better studied and better synthesized than almost anywhere else on the planet is of course a different kind of reflection of Europe's role in the world. Here science reflects the legacy of European power and its affluence, just as both chronological frameworks and watershed moments reflect a preoccupation with the specific history of Western Europe.

How much does this matter? It might matter a great deal. Western Europe, for all that it is impressively well studied, actually covers a modest portion of the world, around 7% of the earth's land surface. The larger continents and the vast areas of the tropics are, in global terms, more significant, a weighting not highly evident in structures of scholarly attention or funding. Outside Western Europe (and within it, in places), industrialism came later and, in some areas, not at all. Further, global relations of extraction such as colonialism find little to no purchase in the theorization of land use and land cover changes within the modelling world. Indeed, as Malm and Hornborg argue,[13] Anthropocene narratives that depict humans *as a species* 'ascending to power over the rest of the Earth System,' falsely naturalize intra-species inequality, noting that the creation of a fossil economy is more the product of particular social relations rather than of essential human biology.

This certainly holds true for farming as well. Not only is agriculture much older than 6,000 years in many regions outside Western Europe, but it was also often differently organized and sometimes more intensive. Intensively farmed landscapes such as the wet-rice systems of Asia and parts of Africa – along with the social and landscape transformations these entail – have been well documented by archaeologists and historians, systems that have in some places persisted for thousands of years. This deep legacy of environmental change has thus far failed to make much impression on Anthropocene enthusiasts, who persist in seeing only the last few centuries, and the future, as a time for the 'geology of man'.[14]

Empirically, the creation of a new geological period seems superfluous. The key element of the Anthropocene – humans as agents of global change – is true of much of the Holocene as well. The ten thousand years of the Holocene is already a geological blip. Not coincidentally, it is also loosely conterminous with one of the most significant changes in human history, the domestication of plants and animals. We must come to terms with and better understand the anthropogenesis of the entire Holocene before we can evaluate the novelty or significance of present-day human impacts. Drawing a line at 1700, 1800, or 1850 runs the danger of implying – incorrectly – that older human-environment interactions were qualitatively different, perhaps in balance and harmony with nature and certainly with humans having had minimal impact on the natural world. Historical scholars already know this not to be true.

While there is much to critique in terms of the empirical substance of the argument for a new geological era, and more importantly, for a posited new relationship between humans and the earth system, there is also something disconcerting in a presumably global science so powerfully built out from European chronologies, histories, and modes of land use and vegetation. If postcolonial thinking requires that we provincialize Europe's history and Europe's knowledge systems, postcolonial global change will also call for a provincialization of the Anthropocene concept.

10. J.O. Kaplan et al., 2009, op. cit., fn 7.

11. This last point is attributed to J.O. Kaplan, K.M. Krumhardt, E.C. Ellis, W.F. Ruddiman, C. Lemmen and K.K. Goldewijk, 'Holocene Carbon Emissions as a Result of Anthropogenic Land Cover Change', *The Holocene* 21(5), 2011, pp. 775-791.

12. E.C. Ellis and N. Ramankutty, 'Putting People on the Map: Anthropogenic Biomes of the World', *Frontiers in Ecology and the Environment* 6(8), 2008, pp. 439-447.

13. A. Malm and A. Hornborg, 'The Geology of Mankind? A Critique of the Anthropocene Narrative', *The Anthropocene Review* 1(1), April 2014, pp. 62-69.

14. P.J. Crutzen, 'Geology of Mankind', *Nature* 415, 2002, p. 23.

Books

ELEPHANTS AND KINGS: An Environmental History by Thomas R. Trautmann. Permanent Black, Ranikhet, 2015.

THE boundaries of environmental history in India have been decisively broadened by *Elephants and Kings*, Thomas Trautmann's engaging and erudite account of why elephants have survived in India when they have disappeared over much of their former range, especially China. Covering more than three thousand years of recorded history and a terrain that extends from North Africa to East Asia, forensically interpreting the material record while trawling through texts as diverse as the *Arthashastra* and a history of the Ringling circus, Trautmann's scholarship is as hugely impressive and graceful as the pachyderms he discusses. Put simply, this is a marvellous book.

Trautmann argues that elephants were prized by Indian kings because they provided a tactical edge in military operations. However, unlike horses which could be bred in captivity and put to use from a young age, elephants had to be captured from the wild since they bred poorly outside the forest and were uneconomical to maintain for the first twenty years of their lives because they could not be put to work. 'So, for all practical purposes, war elephants had to be captured as adults in the wild and then trained. It is this feature of the institution of war elephants that tied Indian kings to the forest: it ensured their practical interest in protecting forests and the wild elephants in them.' This also meant that Indian kings had to have productive relations with forest people and barbarians (*mlechchha*) involving trade and tribute, indicating that forests and their inhabitants were not isolated entities that were the antithesis of plains-based polities, but were intrinsic to the institution of kingdoms and empires.

By 500 BCE, the use of war elephants had become the norm in North India, where it gradually

displaced a Vedic culture centred on horses and chariots. While elephant armies were described in the *Mahabharata* (composed in 800-900 BCE), the heroes of the great battle of Kurukshetra were invariably chariot warriors. Notably, the epic identified riders of war elephants as kings of certain tribes and countries 'forming an arc from north to south along the eastern side of the Indian subcontinent'. These regions were later mapped in the Arthashastra (written around 350 BCE) as reputed to have the best elephants. With the rise of the kingdom of Magadha in the eastern Gangetic plains, especially its empire under the Maurya dynasty, the war elephant came into its own. This historical trajectory was also a geographical one: 'a journey which took the people calling themselves "Arya" from the land of horses into a land of elephants, from the grassy steppe of Central Asia to the monsoon forest of the Ganga valley in North India.'

For Trautmann, this spatial and temporal shift was marked by a close link between the invention of a military technology – the war elephant – and the invention of a political form: kingship. 'Kingship had both the developed form of warfare into which elephants could be fitted to advantage, and the enormous resources required for the capture, training, maintenance, and deployment in war of elephants from the forest.' Historians associated with Alexander, who visited India briefly in 327-4 BCE, record that elephants were rare or absent in republics. The political economy that sustained them is epitomized by the Mauryan kingdom. Megasthenes, ambassador to the court of the first Mauryan emperor, Chandragupta, described its organization: 'A disarmed farmer class whose function is to generate the bulk of taxation which pays for the army; a landless warrior class paid from the treasury; and a monopoly by the king of the ownership of elephants, horses, and arms. This system must have been the main engine of Mauryan expansion, and its unprecedented success would, in turn, have provoked emulation by kings who saw it.'

The institution of kingship enabled the incorporation of elephants as an essential limb of the four-legged beast that was the ideal army: *chaturanga-bala*, composed of foot, horse, chariot and elephant divisions. Trautmann traces the spread of this model from North India to South India, Sri Lanka and South East Asia, and westwards into North Africa and Europe. It is startling to learn that elephants were a part of the armies of Alexander as well as Julius Caesar; in fact, they 'appeared in most of the great battles of antiquity'. To trace their presence, Trautmann explores what must have been unfamiliar territory to an Indianist: the histories of Mesopotamia, China, ancient Greece and Rome. He also steps out of his comfort zone of ancient India to discuss war elephants in the Mughal empire in the 16th century. The sure-footedness with which this book moves across this vast canvas reveals another, awe-inspiring, aspect of Trautmann's scholarship to readers who know the close-grained and meticulous nature of his previous work.

His mastery of classical texts allows Trautmann to draw on Sanskrit poetry and treatises for telling glimpses into the military significance of elephants; using sources as varied as Kalidas's *Ritusamhara* and Neelakantha's *Matangaleela*, his account occasionally takes on the air of a detective story, deducing a coherent narrative from apparently unrelated, scattered clues. Since the practical knowledge of working with war elephants lay with unlettered mahouts and was passed on orally, there are crucial gaps in the written record which Trautmann is partially able to redress with his innovative approach.

Finally, the comparison between India and China: Trautmann relates the persistence of elephants in India and their retreat in China to the different 'land ethics' of these regions, the relations between farming and pastoralism, and military technologies. In China, for reasons which this brief review cannot detail, cavalry was preferred in warfare and elephants were not incorporated into the army. At the same time, intensive agriculture was vigorously promoted. With little value placed on elephants or their habitats, their decline was rapid. This devaluation has a parallel in a period much closer to us: with the Industrial Revolution, the technological and economic efficiency of steam power made animal power obsolete. As elephants, horses and bullocks were displaced from the economy, the land uses associated with their upkeep – forests and pastures – also came to be downgraded in terms of conservation.

Elephants and Kings is a magisterial work which is a pleasure to read. The only flaw in the book is that the main argument is repeated several times; a redundancy in a book as lucid as this. For this is how environmental history should be done: by seamlessly combining a wide-ranging vision with detailed attention to all the elements that converge in the intertwining of nature and culture.

Amita Baviskar
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In memoriam

'Listen to the site'

The music of Charles Correa Architect

THERE is a profusion of riches that Charles Correa leaves in his wake. You would expect that of an architect and urban planner of genius: iconic buildings, townships, a whole new city and ideas voiced far ahead of their times, all of which have attracted honours wherever in the world he has bestowed his music. (He would often say of an architect's main duty, 'He must listen to the site.')

All this has been well covered by people more proficient than I in Charles Correa's chosen fields. As for me, he is remembered every time we sit down to a meal at home. It has to do with our dining table, a brazensteal from the one in his flat in 'Sonmarg', Nepean Sea Road. It is square. He listened to the site.

There is, to start with, the simplicity of the idea. A square is orderly and easy for servings of the sumptuous fare that is always the order of the evening at the Correa's. It seats12 persons exactly and comfortably. The architect places a cap on the number of his guests. So they cannot be just anybody.

The table encourages postprandial chat. Nobody goes anywhere after pudding. Thinking has been stoked. The 12 sit on and on. Twelve is a great number for Apostles. It aids a flow of soul. 'In fact,' says Anil Dharker in a column he wrote on Charles, 'we felt incredibly intelligent there.'

The square table illustrates three of the many things that good architecture must accomplish. Serve. Please. Enrich. Charles' thinking for 'Sonmarg' matches the sculpting of space, concrete and steel that emerges from his office.

Architects are blessed by their profession. It covers like none other a sweep of pretty much all of the arts and sciences. In the case of Charles Correa, he brought with him a mind and spirit already prepared for all that his profession would demand. He ended up a major figure in contemporary architecture around the world. At home, he played a pivotal role in creating the characteristic gestures of post-Independence architecture.

His first important project was the Gandhi Memorial at Sabarmati Ashram in Ahmedabad (1958). Here was his first statement in the use of natural ventilation and passive energy, with the structure's slatted panels doing duty for windows , courtyards ('rooms open to the sky') and the pitch of roofs contributing to effective ventilation, subtracting the need for air-conditioning.

He brought this approach to much else of his work e.g., the National Crafts Museum in New Delhi. In 1967, he designed the Madhya Pradesh Legislative Assembly and Bharat Bhavan in Bhopal, the Jawahar Kala Kendra in Jaipur, 'Kanchenjunga', a 28-storied landmark at Kemps Corner, Mumbai, the British Council building in Delhi and the McGovern Institute for Brain Research at MIT, Boston. In the late 1960s he designed

the ITDC hotel in Kovalam, a building clinging to a hillside that looks out upon the Arabian Sea. The 'Hotel Cidade de Goa' was another of his hotel-by-the-sea creations. Abroad, one of Charles' later, if more important, projects is the Ismaili Centre in Toronto, Canada. It is located in the midst of formal gardens, surrounded by a large park.

In 1984, he co-founded the Urban Design Research Institute in Bombay, dedicated to protection of the built environment and improvement of urban communities. In 1985, Prime Minister Rajiv Gandhi appointed him Chairman of the National Commission on Urbanization. From 2005 until his resignation in 2008, Charles was Chairman of the Delhi Urban Arts Commission. In 2013, the Royal Institute of British Architects held a retrospective exhibition, 'Charles Correa – India's Greatest Architect.' It focused on the influence of his work on modern urban Indian architecture.

During the final four decades of his life, Charles pioneered thinking on urban issues and low-cost shelter in the Third World. As at any time, at home or elsewhere, his work placed emphasis on prevailing resources, energy and climate as major determinants in the ordering of space.

Predictably, it's been prizes and awards all the way for Charles Correa, among the main ones being the Gold Medal of the Royal Institute of British Architects (1984), the Praemium Imperiale of Japan – a Nobel of its kind (1994), and at home the Padma Shri (1972) and then the Padma Vibhushan (2006).

From 1970 to 1975, he was Chief Architect for New Bombay (Navi Mumbai), an urban growth centre of two million people across the harbour from the existing city of Mumbai. Here, along with Shirish Patel and Pravina Mehta, he was involved in extensive urban planning of the new city. Something that I share with Charles, apart from being 'Bombaicars' (Goans in Bombay), is a devotion to what we call home, the city of Bombay. And who knows if that extends to Mumbai. Over 30 years ago, he pressed a red alert which today needs to be a panic button about uncontrolled, unplanned growth of the city. He eyed the mainland from which the city pokes a finger into the Arabian Sea. There he saw a New Bombay.

A film got made about his visionary 'City on the Water'. Near the end of the film, the voice-over (Pearl Padamsee) articulates Charles' own concerns about the new city: 'Do you think we will make it?' going on to ask, 'Do you think we will be able to turn Bombay again into a place we can live in and work in and enjoy being in?'

The way things have gone since then provide the answer. Politics and political goals are all – something with which Charles had a lifelong problem. Ours has become a democracy of the people, by the people but, far too often, against the people. There's a postscript to 'City on the Water'.

B.G. Deshmukh, Chief Secretary of Maharashtra at the time, has written *A Cabinet Secretary Looks Back: From Poona to the Prime Minister's Office*. He recalls that in 1970 the state government notified acquisition of many thousands of square miles of *agri* land on the mainland. This was to be for New Bombay. But it never happened. Deshmukh, an on-the-spot witness, explains why.

A year later, in 1971, the V.P. Naik government received a bill for contribution to Indira Gandhi's *Garibi Hatao* campaign. There was only one way he could pay: stall purchase of the land across the harbour and sell to builders land that was still under water in Backbay. This is now Nariman Point, a business district. It aggravates one of the huge problems Charles and his colleagues had sought to head off, those of an incurable North-South city. We were not cured. We are even worse off today than 40 years ago. We dropped the pilot and lost the plot.

The Charles Correa Plan of transforming Bombay's mill lands into hundreds of square kilometres given back to the city for leisure and societal needs – this was opposed by the politician-builder nexus. Though the fight for the plan was won by Iqbal Chagla in the Bombay High Court, it was lost in Delhi in the Supreme Court. Nonetheless, the battle did something important. It showed that there was indeed land in Bombay that could be used in a humane, Charles Correa way.

So, all is not lost despite the corruptions the blunders and the investments in ugliness. The original vision has indeed become Vashi. A new Draft Development Plan for Mumbai does specify an obligatory trans-harbour bridge, a key point in Charles' vision of introducing an East-West element in the way our city moves. Forty years late. But then we in India view time in an epic way. Everything is an eternal present.

Who knows what creeping catastrophes would have overtaken us if Charles' ideas in the late 1960s had not been accepted by government – much to Charles' own surprise.

Two final thoughts, one personal and perhaps trivia. It was 1961. This writer was in Lintas, the advertising agency. Our major owner and client,

Hindustan Lever, was to participate in the International Trade Fair on Pragati Maidan. Who would design the pavilion? It is not clear quite how it happened, but the right decision got taken. Charles Correa.

He came up with what is now one of his more famous buildings. It was an elongated, crouching, windowless structure of exposed concrete, with ventilation and light arriving through vents (a Correa signature) placed at dramatic angles to the main structure. K.T. Chandy, a Hindustan Lever director who arrived to approve it, termed it 'A cubist igloo', a description drowned in the professional acclaim accorded to it then and ever since.

For some illogical reason, because he was a copywriter in the agency at the time, this chronicler was put in charge of illuminating the structure, internally and externally. The answer seemed obvious: to lay long tube lights along the lines wherever the ground met Charles' soaring planes (or they met each other), inside or outside. Hopefully this would provide enough illumination.

It did. Charles looked at the net effect and the look on his face was a relief. 'I'd never have thought of that,' he said. 'It looks great.'

And now the building which many consider his master work, which he himself prizes as his best work, the Champalimaud Centre for the Unknown in Lisbon, Portugal. To repeat what Charles has said unforgettably about architects and their work, 'You must listen to the site.' And what a site that is, where the mouth of the River Tagus kisses the Atlantic Ocean, 400 meters from the piers that launched the Portuguese caravels east and west into the unknown. It was the Kennedy Space Centre of the 16th century. Charles said, 'My effort here is to get the Portuguese to feel again the oceans which they navigated and conquered, to bring back that sense of excellence which is latent even now.' He adds, 'Here I thought architecture could be sculpture. And beauty could be therapy.'

There is of course much else. Gita Mehta, a friend for over half a century, now in New York, writes in a mail about our loss of Charles, 'You must all be devastated. He was so much a part of the best of another Bombay and another time when to be creative was the highest form of being.'

Anil Dharker ends his column about Charles saying, 'There will never be another like him.' To which we might add, 'How will we do without him in our city?' And indeed in our world, if we credit the citation of the Royal Institute of British Architects.

Gerson da Cunha

Backpage

THE Indian discourse on the state of our democracy remains deeply schizophrenic. At one level our leaders and commentators favour a self-description as 'the world's largest democracy', slyly placing India among the 'advanced and mature' western democracies while emphatically distancing it from less fortunate neighbours, pointing to their proclivity to ever so often lapse into authoritarian/military governing arrangements. Yet internally, both experts and lay citizens have for long expressed a deep concern about the state of our democratic institutions, practices and values. Sometimes, so extreme is the disgust and self-loathing that one wonders if the last six plus decades as an independent republic have only been an exercise in collective myth-making and amnesia.

Fortunately, we do not have to rely on subjective assessments, whether our own or of experts, to get a better sense of what our people think about the idea of democracy, what it means to them, the level of trust we have in our public institutions, the vibrancy of our civil society organizations, the degree to which 'democratic' norms and values have been internalized, and so on – in brief, where do we, as a nation and people, stand and how we have changed over time. The recently released report, 'State of Democracy in India', prepared by the Lokniti team and the Centre for the Study of Developing Societies, has enough data and analysis to keep all of us interested and busy for some time.

Even as it will take some time for a more considered response, nevertheless, the summary tables and presentation at the report's release raise some intriguing questions. More specifically, the suggestion that over the decade since the previous survey was carried out, the proportion of respondents willing to express conditional support to non-democratic/authoritarian arrangements has risen, though marginally, is worrying. Worse, at first glance the data suggests greater support for authoritarian measures amongst the better-off, upper caste, better-educated, metro residents. However, when read against the data on increasing electoral turnouts and participation, both amongst the rural disadvantaged/marginalized as also the urban middle classes who traditionally were among the low participants, the picture becomes muddied. So, is the Indian story one of deeper and growing democratization, whatever the infirmities, or should we be more concerned about the limits of our institutional architecture drowning out our potential.

Both literature and experience from other parts of the world warns about the Janus-faced character of the middle class property owners, traders, professionals. These strata provide the leadership of both the democratic movements as also of the critics and subverters; help the transition towards a more impersonal and rule-based system, but equally display an impatience with procedures seen as 'slowing down' delivery, and arrangements which 'pander to' the masses – subsides, affirmative action, legal entitlements and so on. The impatience can lead to an express preference for short-cuts, a privileging of results over procedure, and a proclivity to muzzle dissent. Sounds familiar?

A second intriguing piece of data relates to a 'dramatic' upsurge in the trust in Parliament, even as the overall picture of trust, measured for ten different institutions – local to national, electoral and non-electoral – remains stable. Unsurprisingly, trust levels in non-electoral institutions like the Army, Election Commission, Supreme Court, to list a few – staffed by experts and, in relative terms, distanced from the citizens – remains high. Equally, institutions like the police, local government, politicians and political parties enjoy depressingly low levels of trust.

In itself, this is not surprising. Familiarity and more regular/everyday interaction with public institutions charged with ensuring delivery of public goods and services is often an unpleasant experience. Rude behaviours, demand for bribes combined with an inflated sense of importance and power, is a deeply internalized social truth. Unfortunately, media portrayals do little to dispel this image, whatever the reality. An improved perception for the Parliament – both the institution and its members – thus comes as a surprise.

Most media portrayals of the functioning of Parliament and the behaviour of parliamentarians – within the House and outside – cannot be called flattering. So what explains the survey results? Is it, perchance, that hegemonic media descriptions only reflect the social bias of the better-off, urban elite, while the 'masses' who need the promise embedded in democratic arrangements have a different perception?

Hopefully, a closer reading of the survey data will help us interrogate our own perceptions/prejudices. At stake is both how we understand and what we are willing to do to rework our political arrangements.

Harsh Sethi