Chapter 1
Prehistory, History and Contemporary: Evaluation of the Idea of Sustainability in Light of Human–Nature Interphase

Biplob Kr Modak, Mainak Sarkar, and Sankar Bhattacharyya

Abstract The word 'Sustainability' and its current connotation are fairly modern, only since 1983 when UN Commission on Environment and Development started to use the term as we understand it today. Irrespective of the idea and the practice, the concept itself is not new and can be traced back to prehistory. Religious themes of the early human community of hunter-gatherers and the present-day indigenous population often include the practice of sustainable ways. Less-organized ancestral religious practices and systems of indigenous faith have at their core the seeds of the idea of sustainability. The idea stems from a more direct connection with nature, proximity to relatively untamed natural forces, knowledge of local flora and fauna and limited economic urgency that supports a relatively sustainable lifestyle for these people. Though the idea of sustainability is around within the collective consciousness of human societies since time immemorial, the evidence does not always comply that human beings innately behave with understanding sustainability. The popular understanding of the present-day paints a picture of man as a 'noble savage' who prior to 'corruption' brought about by modern 'civilization' lived in harmony with each other and nature. Contrary to these beliefs, detailed archaeological and anthropological study of environmental history reveals that the idea that we lived our life sustainably prior to modern civilization may not be always true and certainly not what is universal for human nature. For the most part in our history of 200,000 years of existence, the human ability to modify nature, the technology available, scale and scope of the economy, population number and productivity remained at a state that kept the ecological footprint and impact of an anthropogenic effect on environment fairly limited. Since the industrial revolution, our technological advances and productivity and need for energy have far exceeded the level where we could maintain an acceptable level of sustainability and are now having a devastating impact on our environment. Unprecedented advances in agro-technology and

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medicine in the last century ensured human population explosion and expanded the ecological footprint of human beings to every corner of the globe. In this chapter, we discussed the prehistory, history and current concept of sustainability, evolving nature of human–nature interaction and sources and solutions for current climate worries, mass extinction threat, ecological disaster and eco-awareness of the current generation as a chief driving force that can mitigate the unprecedented crises we face as a species today.

Keywords Anthropocene · Anthropogenic effect · Ecological footprint · Climate crises · Global equity · Globalization · Indigenous faith · Mass extinction · Sustainability · Sustainable development

1.1 Introduction

Human beings are somewhat unique in their ability to substantially alter the physical surroundings in which they live. The fact that a settling human population alter their environment is not unique in itself, as any dominant or abundant species are ought to alter their surroundings to some degree. The uniqueness of human ability to change their surroundings lies in the fact that in their pursuit of a better standard of living, human beings are dogged, persistent and, most importantly, consciously aware of how to achieve that goal. Palaeolithic stone carving was not random but purposeful with hindsight and foresight behind each delicate stroke, and using fire was a conscious choice and perhaps the first instance of purposeful generation of polluting by-products. This mental model and ability to refine and apply that model to the physical world separate humans from other tool-using animals and perhaps sowed the seed of unsustainable exploitation of the environment. Often the intent alone is not enough, but the ability to innovate to apply the intent is an important driving force for every culture and mega civilization that ever lived including the present civilization. Micro-level natural changes in prehistoric surroundings shaped historical vocations, whereas macro-level climate swings led to a wide range of specialized opportunities in the past. Variances in production and lifestyle are influenced by regional differences. People from different cultures can pick, relocate and increase their spheres of influence as prehistoric culture evolves. For example, the extended ice age during Pleistocene Epoch saw Neanderthals thrive in modern-day Europe as cold-adopted specialists yet may lack the skills and cunningness of migrating ancestors of modern humans, thus becoming outcompeted and ultimately extinct. Techniques and tools improved as did human cognitive ability, often with reciprocal neural input that made tool-making ability refined, a motor skill developed and cognitive skills heightened with analytical and abstract thinking abilities and acquisition of language skills (Stout and Chaminade 2012). The complex social structure that revolved around a regular tribal group of hunter-gatherers numbering

about 30 individuals expanded their cultural reach to the conglomerate of tribes including as many individuals as 150, although such groupings were occasional rather than typical hunter-gatherer band (Dunbar 2010).

It's always difficult to trace the exact evolutionary point of origin for human collaboration, but as far we know from the general evolutionary trends of primates and closest anthropoid relatives of humans and still from the prehistoric site for 'nesting and resting' of our Paleolithic ancestors, human beings were always social animals with a complex social structure that demands increased cognitive skills and cooperative behaviour even between strangers. One of the few ways we may learn about our ancestors' foraging methods, cooperative behaviour is by studying current foraging communities (Marlowe 2005). Group memberships are constantly reshuffled as a result of cultural learning and punishments for those who break the rules (Boyd et al. 2011). More cooperative groupings tend to thrive, while ultra-competitive, weakly cooperative group falls to the Hobbesian cycle and fails to maintain the sustained population level as the resource is always limited when everyone is competing for the possession of the highest value resource (McNamara et al. 2008). With the help of a wide range of individuals and resources, teamwork can also be experienced.

Religion and spirituality are difficult concepts to define. Even while 'religion' appears to be the more tangible term, it has proved difficult to define it in a way that leads to scholarly agreement. Major faith systems share several core principles, according to Loewenthal (1995), such as the belief in a divine source for morality, that life is all about good deeds and avoiding evil, and a belief in a spiritual existence (Monotheism). As the focus swings away from religion and towards spirituality, it has been referred to as a 'spiritual revolution' (Tacey 2004; Heelas and Woodhead 2008).

When religion specifically started and what was the form of a proto religion is a highly debated topic amongst anthropologists and social scientists, early human tribes much like some of the existing indigenous people throughout the world practised animism and shamanic practices, characterized by anthropomorphism, totemic and nature worship rituals (Peoples et al. 2016). The belief system that considered plant and animal life as sacred, river and mountains as god or force of nature that can be prayed and pleaded to and certain animals being spirit animal (totem animals, spiritual guide) of a tribe was common amongst Mesoamerican culture as well as many other parts of the world. Animistic culture and belief that animals and plants are capable of language and intellect were widespread amongst many native Mesoamerican, indigenous people of Polynesia and indigenous people of India (Encyclopedia Britannica 2020) and point towards the fact that such belief system may predate any existing mainstream religion. Even during the era of Buddha, the telling of Jataka and latter telling from Panchatantra in India and fables of Aesop from Greece continue this tradition. Although the variation in practices and rituals is considerable, there seems to be some universal common amongst these belief systems, respecting nature, abstaining from exploitation and unnecessary harm, depicting certain plants and animals as sacred and protecting them.

Besides cities and towns, humans can be found all over the planet as animal species. The deep-sea is the only unexplored part of the planet where human activity has failed to leave its mark till now. Coexistence between humans and nature must be a top priority if the Earth is to survive (Iwatsuki 2008). In Japan at the time of the Meiji Restoration in 1868, there was the realization that Western culture was superior, which led to the establishment of an exceptional education system modelled exclusively after Western pedagogy and education. The fact was that Western countries and Japan were most likely at the same level of civilization in terms of material wealth at that time. Yet since the adoption of the Western model of development in the Japanese Archipelago, there has been the development of serious environmental issues (Iwatsuki 2008).

Human–environment interactions are frequently seen as a key factor in assessing environmental challenges (Roy et al. 2013). Land transformation, climate change, bio-geographical and biogeochemical modifications as well as habitat fragmentation have all contributed to the destruction of the majority of Earth's ecosystems (Vitousek et al. 1997; Ellis and Ramankutty 2008). Researchers from a variety of academic fields have been investigating environmental change during the past four decades (Redman 1999). It is generally agreed that humans are the primary source of the disturbance. Natural systems had already been tampered with by humans and beyond the scope of natural restoration without active effort (Primack et al. 2001). Conservation biology today offers a unique example of how human and natural systems can be integrated under the concept of sustainable management of natural systems (López et al. 2021).

Conservation efforts like the Chipko forest-protection movement are based on the long-held belief that trees and sacred forests are hallowed places (Shiva and Bandyopadhyay 1986). In contrast, Morrison and Lycett (2014) focus on the social constructivism of Indian forests, which have been exploited since the Neolithic, and whose long history of exploitation challenges the popular trope of the timeless, primordial sacred forest disturbed only by colonial developers (Gadgil and Guha 1993; Bhat et al. 2001; Morrison and Lycett 2014). According to Clement et al. (2015), evidence from Cambodia and Amazonia (formerly thought regarded as 'virgin' tropical forest areas) supports their thesis that 'nature, or the environment, is always anthropogenic, and anthropogenesis is eternal'.

When it comes to developing countries, anthropogenic climate change is offering new circumstances for growth, which could be referred to as the climate change in the context of development'. As a result of human activity, there are 'socially produced' difficulties, which is why global warming is a problem not restricted to ecology and biodiversity but directly and indirectly affects the world economy, stability and global peace. Many individuals in poor countries are struggling to make ends meet due to climate change, which is causing their living situations to shift and become less predictable. By affecting agricultural, pastoral, fisheries and forestry resources that are the primary sources of income for rural populations, climate change is now directly impacting their livelihood and standard of living. Although little research has been done on this, it will have an influence on infrastructure, housing, public services, employment, the informal sector and the urban economy

in general as rural–urban exchanges, such as the flow of goods, services and money between rural and urban livelihoods, will be impacted (Cannon and Müller-Mahn 2010). According to scientific consensus, climate-related threats are becoming more frequent and intense. To put it another way, catastrophic disasters have a direct influence on people's livelihoods by taking away their most valuable resources. Adaptation and mitigation are garnering significantly more attention as the discussion on how to respond to global warming continues. Millions of people in underdeveloped countries are already the focus of numerous non-governmental organizations, governments and donors' efforts to help them adapt to the effects of inevitable climate change. As a result, adaptation and 'development' can no longer be distinguished. It's not yet apparent how adaptation and development are connected (Tanner and Mitchell 2008). Policy and practice in development are being influenced by discussions about climate change (and the scientific interpretations of such discussions). To put it another way, climate change has a direct impact on the development practice's subject matter as well as its object (people, natural resources, other assets and their lives). The notions used to mediate these arguments necessitate clarification (Cannon and Müller-Mahn 2010).

1.2 Always in Harmony? From Pleistocene Overkill to the Destruction of Harappan Civilization, a Warning for Future

Though the hunter-gatherers of the paleo and neolithic era may have lived in a small band of 30 or so individuals, many have adopted animistic or shamanic proto-religion, but whether man ever truly learned to coexist sustainably with her surrounding is a real question of contention. Of many simultaneously existing hominids and members of genus *Homo*, only *Homo sapiens* remain today. Extinction of other human species by the modern human cannot be conclusively ruled out (Diamond 1992), neither the near-perfect alignment of extinction of megafauna in every landmass soon after the arrival of migrating humans (Modak 2007), giving rise to the suspicion that exploitation of nature and inability to resist temptation could be as ancient as human nature itself (Fig. 1.1).

Sustained localized overkilling and hunting by even a relatively small group of prehistoric humans armed with unsophisticated hunting weapons could have put severe pressure and population shrinking for large body size animals, which could have been already pressured under climatic shift. The arrival of Maoris in New Zealand during the late thirteenth quickly led to the decline of Moa (giant flightless bird), and all appear to have been extinct within 100 years. The role of Maori hunters in the extinction of Moa is amply documented (Modak 2007). It was around the end of the Pleistocene when the Americas lost more than half their large animal species (Prufer 1968; Martin and Steadman 1999). There is ample reason to believe that predation pressure exerted by the newly arrived human population on

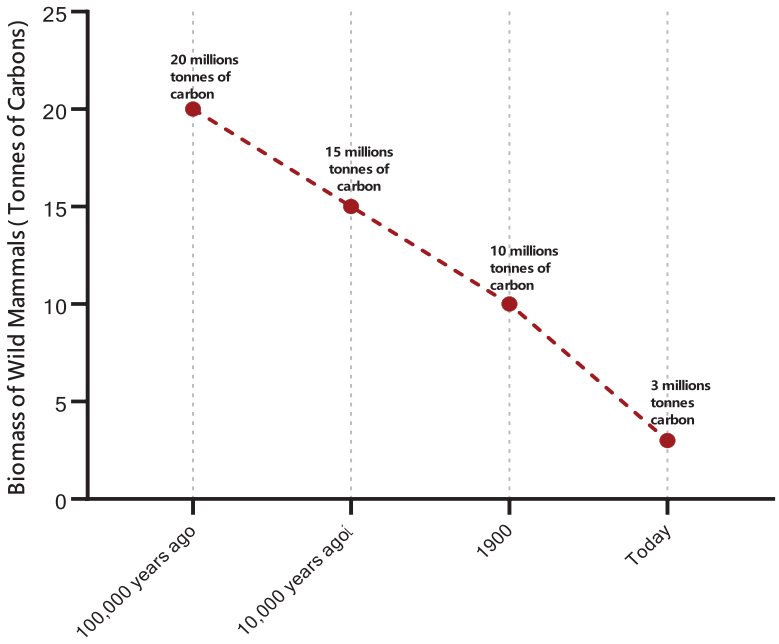

Fig. 1.1 The long-run decline of the world's wild mammal. Estimates of the total biomass of the world's wild land mammals. Biomass provides a proxy for the richness of the mammal kingdom (Source: https://ourworldindata.org/mammals)

megafauna caused this spectacular occurrence. End-Pleistocene North American human and large herbivore population dynamics simulations suggest that megafaunal extinction may be explained by a fully mechanistic model that incorporates anthropogenic effects and does not include climate change or other ecological impacts (Alroy 2001). It seems too coincidental that the first reliable evidence of major human populations in the Americas dates back to 13,400 years ago (Fiedel 1999), overlapping precisely with the start of the extinction spasm (Prufer 1968; Martin and Steadman 1999).

Indus valley civilization or Harappan civilization that spanned from 3300 BCE to around 1300 BCE is one of the most recognizable and celebrated early bronze-age civilizations. During its zenith in 2300–2000 BCE, the Harappan civilization established a mega-urban conglomeration that boasts ingenious city planning and remarkable modern urban centres with the earliest form of urban planning, sewer management and socio-political egalitarianism (Green 2021). Almost abrupt and sudden dissertation of largest cities of Harappan civilization remains a bit of mystery even today. Although the whole civilization didn't suddenly disappear, and scholars seem to agree that from large urban centres, people from Harappan culture periodically and steadily disseminated in the wider surrounding areas carrying with them memorable relics of their civilization (Sanyal 2012). Nevertheless, such desertion of big cities like Mohenjo Daro, in such a remarkable state of preservation,

points towards some sort of calamity. The calamity could be due to drying and changing of course of river *Ravi* and *Sind* or perhaps due to land erosion, reduced soil fertility and deforestation influenced draught. Childe (1950) and Adams (1966) defined the reversal of a few abstract metropolitan characteristics, which is also germane to the topic of Harappan civilization's demise. This civilization's 'advanced traits were washed down by mingling with impoverished local civilizations until what was once distinct Harappan was diminished to the point of nonexistence', says David Dales (1966). In reality, the economic catastrophe is a catalyst for cultural devolution and a shift in society's engagement (Dikshit 1979). For nearly a thousand years, the Harappan civilization remained essentially the same. It is also possible that man-made deforestation in Sind, which 'stopped moisture transpiration and reduced rainfall', is to blame for some of the damage in the last phase. There was a lot more rain and deeper trees in the populated area in the past. According to Piggott (1950), the amount of fuel needed to burn millions of bricks for housing projects in major Harappan cities, the agricultural activities required to support the large communities and the presence of extensive drainage and lavish community baths meant that Sind was much drier when Mohenjo Daro flourished compared to present day. Consequently, the final demise of civilization was largely due to the 'wearing out' of the land. The western militant forces, particularly the Aryans, could have contributed to the destruction of Mohenjo Daro (Fairservis 1961).

The increased use of any technology inevitably results in higher living standards, lower infant mortality and longer life spans. The increased life expectancy alone will increase the population over time; even if a community has a minimal replacement strategy for birth rate (how this can be achieved in the absence of advanced birth control measures is a distinct topic). The population triangle can be flipped, resulting in a new set of instability if population control is aggressively sought. Human nature's desire for a better quality of living and competitive edge (if nothing else, then to attract a better mate) will prevent equilibrium from being established in a structured environment. By virtue of its intrinsic instability, no community can maintain equilibrium in the level of life by common consent (Yadav 2011). For example, in Harappa, it appears that a major river dried up just as the city's technical exploitation was reaching its zenith. The wealthy and businessmen are the first to go when the economy starts to falter (Kenoyer 2008). Anarchy is inevitable if there is no government in place to keep order. As a result, a civilization is fundamentally on a self-contradictory track while it is fully exploiting its current potential. To avoid a collapse in the near future, not only does it have the highest degree of prosperity, but it also has to promptly come up with the next level of rising. Civilization will fail to meet cultural expectations if such a revolution does not take place, and the ensuing anarchy will finally consume the entire society if it does not (Turchin 2009). The state of Harappan civilization serves as a constant reminder of the fact that achieving technological marvel or extraordinary urban planning capacity is not always enough to sustain a civilization, and remarkably advanced culture and society can become decrepit, annihilated and assimilated in the long road of history if their paths are in odds with nature.

1.3 Relationship with Nature in Ancient India

Around 1200 BCE, increasing urbanization and altering political systems began to challenge traditional Vedic worldviews. Buddhist and Hindu religious philosophers responded by developing new ecological concerns. It is Julia Shaw's (2013) goal in her research to examine how Indic conceptions of 'culture', human well-being, violence and non-violence, as well as the purity and pollution of nature, are related to modern environmentalist discourse. Buddhism has been warped by a skewed view of environmentalism that emphasizes 'nature' as a separate entity from humans. Compassion is regarded as important to the environmental movement because it is concerned for animal welfare and understanding of the negative effects of environmental stress on human well-being and misery. There are several active study forums on the topic of religion and environment, which is constantly evolving. Archaeology, on the other hand, has given little attention to environmental ethics, save from a few publications on heritage and landscape ethics that have set the stage (Dalglish 2012). Before modern climate models, the alleged decrease of the summer monsoon in 2100 BC (4.1 Ky BP) and its impact on the transition of Harappan urbanism after 1900 BC (Dixit et al. 2014) were included in models of urban decline and collapse of major Harappan cities. Several long-term questions remain unanswered regarding processes that serve as the backdrop to the history of religion after the collapse of Harappan civilization and the establishment of Vedic civilization. Processes that led to Rig Veda's composition and the reemergence of urbanism and complex political organization in the Gangetic Valley some 1000 years later remained largely shrouded in mystery. The use of iron for tool making and discovery of iron smelting techniques, which allowed the growth of intensive agriculture and previously inaccessible wooded areas, could be a crucial factor in this reemergence of urban complexes as the centre for cultural and economic exchange, leading subsequently to shift from micro-level economy and production to larger and more organized industrial, treading and agricultural endeavours around 1000 BCE in India. Environmental changes were intertwined with ancient Vedic rituals and worldviews. Likewise, changes in material culture and intellectual and practical responses based on religion are also entwined. There is still debate about the relationship between urbanization and environmental history, particularly when urban-based polities advanced westward from the Gangetic valley around the third century BC. In response to urban problems like poverty, disease and pollution, and to alleviate the associated suffering, Buddhism, for example, is seen as both a cause and an outcome of urbanization (Bailey and Mabbett 2003; Shaw 2013). In response to the modern challenges of rapid urbanization, industrialization and the ironically titled Green Revolution, the contemporary environmental discourse has drawn on ancient Indian traditions of religious–philosophical knowledge as representing a pre-modern ecological utopia. Often these expectations of environmental care are based upon social, environmental, political and economics of an era that is not consistent with modern realities (Shiva 1992). Even though there are multiple widely-cited explanations for these beliefs, only a few accept that the sense of 'nature', which is believed to be the foundation of Indic civilization, is socially and culturally produced.

1.4 Runway Cataclysm: Industrial Revolution and European Colonialism Triggering Snowballing Climate Change

The spread of European colonialism since the early fifteenth century began with the discovery of a maritime route to Africa, Mesoamerica and eventually to India. Colonials brought disease and war and invader species of plant and animals that divested local ecology and decimated the native population (Diamond and Renfrew 1997) with which knowledge of the surroundings gathered for centuries was lost. Unknown to local ecology and ignorant to any sustainable economic programme, the colonial hubris in every colonized land developed in grotesque demonstration of arrogance, greed and exploitation of people and their land for profiteering. Plantation of non-food vegetation such as indigo and opium in colonized land through bonded labour or subjugation through fear brought countless miseries including famine in occupied lands (Klid 2021). Countless revolutions in various occupied lands were recorded, where indigenous people revolted due to loss of their ancestral land to colonial-style crop culture and deforestation and also by traditional farmers for compelling them to abandon fertile land for plantation of opium or indigo (Mcaleer 2019). Trade and natural resources are two of the most important factors in a colonial empire's success. Natural resource extraction and cash crop production were used to make this happen. These were frequently carried out with a (at best) reluctant concern for the local environment and (at worst) with negligible concern for it (Fairhead and Leach 2000). As a result, long-term environmental impacts (often relating to indigenous populations'well-being) were pushed to the side to profit from the very expensive enterprise of controlling a significant colony. It is possible to create incredibly unique ecosystems with species of flora and fauna that cannot be found anywhere else on the planet because of their extreme geographic isolation. There are ecological wonders that have been created over thousands of years and may contain thousands of life forms that are yet to be discovered by science. These ecosystems, however, can be destroyed in a few decades if environmental mismanagement is allowed to go unchecked. For the organisms affected, there is nowhere else to go, and they often struggle to survive in a rapidly alien environment that is fundamentally different from one they had adapted to over millennia (Wood 2015). Since the Columbian exchange, the emergence of colonial powers devised a system of colonial control to amass maximum resources, at maximum efficiency level at the shortest time possible leading to complete disregard for ecological balance and paving the way for exploitation of nature at an industrial scale resulting in mass-scale deforestation, pollution, land degradation, groundwater depletion and eventually climate change. To a large degree, the economic and industrial model established by the colonial system became the template for modern development strategies. The exploitation of resources disregarding the cost of such exploitation on the ecosystem became the engine for global development and economy aiming for ever-increasing GDP and per capita income. Productivity and GDP become the only index for measuring improvement of quality of life for the human population, a model adopted by the colonists and the colonized and new freed former colonies.

Early imperial powers sought to mould the environments they encountered into the most advantageous and strategic configuration possible. In stark contrast to the indigenous societies, which adapted their way of life to the natural environment around them, the colonial power's decision to alter the environment was a declaration of its political dominance. As a result, the indigenous peoples of the territory would have to choose between relocating (to a marginal, remote or otherwise occupied area) or accepting a new role in colonial society. This was almost exclusively the role of an exploited worker with few rights and a proclivity for self-promotion and self-interested behaviour. Civilians fleeing the effects of war and the subsequent rebuilding process cause the most ecological damage from wars. As a result of the lack of formal infrastructure, many refugees and displaced persons are forced to exploit natural resources to survive. People turning to bushmeat as a primary food source may witness an increase in poaching in and around conflict zones (Binns et al. 2012). Refugees fleeing conflict zone with little to no supplies or money were often confined to underfunded camps. Poverty has the same negative effects on the environment, but the sheer number of people affected magnifies these dangers. People who have been displaced in large numbers are more likely to get involved in conflicts because they have few economic options while they are still living as refugees. It is the global imperial powers that have played a major role in creating the climate change crisis that will confront the people of this planet in the coming century. CO_2 emissions have always been a major problem for these so-called developed countries, and they continue to be some of the biggest emitters per capita today (IPCC 2013a, b). ND-Gain Index from the University of Notre Dame (Chen et al. 2015) shows how well nations are preparing for the impacts of climate change based on a variety of vulnerability and readiness factors. Due to inequity of wealth, the vulnerability of economy and geographical location, European-developed nations and their ex-colonies will face vastly different climate change risks in the future.

1.5 Economic and Developmental Boom Post-1950s and Population Explosion: An Unstoppable March Towards Abbeys?

During the post-colonial era, the model of the imperial and colonial economic model was not replaced, an unsustainable approach for economic development became more intense, and colonial arrogance has given way to multinational corporate profit mongering and competition between global statesmen for development at any cost. The situation was further complicated by an unprecedented population boom since the 1950s (Van Bavel 2013). The population at the start of 1900 was fewer than 2 billion, became 2.5 billion during 1950 and from 3 billion in 1959 and just within 40 years in 1999, human population doubled to 6 billion. Coupled with the gigantic hydroelectric dam-building competition that engulfed superpowers like the United States and Soviet Russia and quickly spread to developing countries like

China and India, without any consideration to cost-to-benefit ratio of such projects and culminated in inevitable tragedies with landslides and flooding, and unfortunately, the tradition is still very much alive today. Construction frenzy and urbanization drive that started in megacities of the world spread to developing countries consuming every wetland, sanctuary, cultivable land even forest (Figs. 1.2 and 1.3). As a result of globalization, the environment has been made subject to an additional strain. Carbon emissions caused by deforestation are estimated by the World Bank to be 20% of the world's total emissions. Increased international trade has also led to increased fishing, deforestation and pollution levels previously unrecorded.

Profit-oriented capitalism and technological advancement, human population explosion and poverty are the key factors responsible for present unsustainable development. Since the industrial revolution that started in Europe and expansionist colonialism, several countries in Europe and the United States became intensely industrialized with increasingly sophisticated technologies that allowed them to exploit and extract resources more efficiently than the rest of the world. Countries that showed the greatest technological advancement also produced pollutants and unsustainable development practices to the highest extent. In the developed nations, on a per capita basis, citizens consume more food and use more pesticides, fertilizers, fuel, minerals, cars and other manufactured products adding pollutants to our

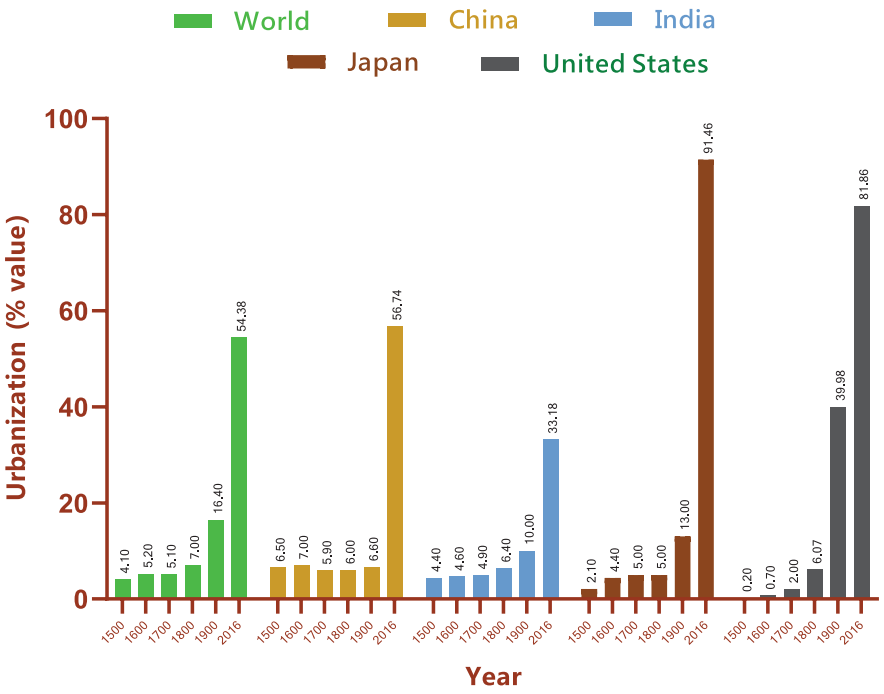

Fig. 1.2 Urbanization over the last 500 years, from 1500 to 2016 (percentage of the total population living in urban areas) (Source: Data published by UN World Urbanization Prospects 2018 and others)

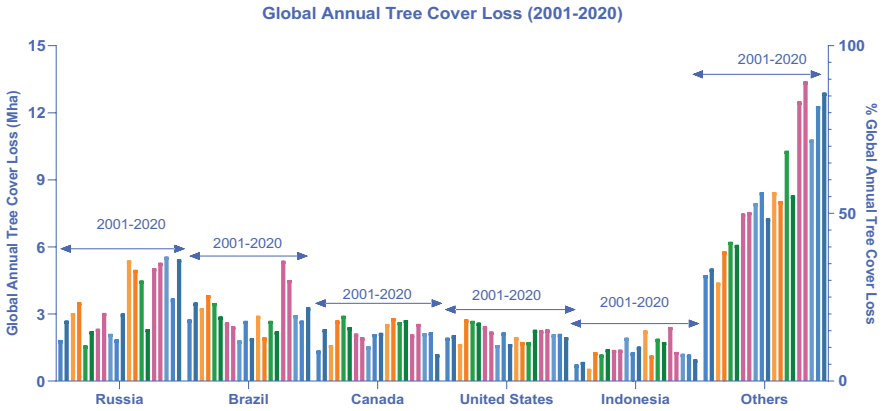

Fig. 1.3 Global annual tree cover loss from 2001 to 2020 (Source: https://gfw.global/3EhliRZ)

environment and causing colossal pollution (Table 1.1). Every year, air pollution kills thousands of people (Fig. 1.4), and the problem has become acute in developing nations as higher population densities and limited infrastructure expose them to automobile, industrial as well as household air pollutants. In the developing countries, nature of pollutants may differ, per capita consumption may be far lower, yet as the population pressure is much higher, the unsustainable industrial process leads to a severe polluting effect on the environment.

The level of pollution made by an American citizen is equivalent to 17 Indians or 135 Nepalese people. The most highly industrialized societies have the greatest per capita rates of consumption of energy and other resources. The United States, for example, has about 5% of the world population and accounts for about 25% of the world's consumption of resources. The developed nations as a group have 20% of the world's population and are responsible for 60% of resource consumption. Societies with high rates of consumption have correspondingly high rates of production of greenhouse gases and waste products. Exporting the ecological cost to other relatively low-income countries for the production of items that are highly in demand in developed nations has worsened the situation. For example, 18 Mha of the Amazonian forest has been cleared in Brazil to meet the European and American coffee demand. Germany causes the degradation of 2 lakhs ha of the rainforest a year for timber. Consumption of resources and pollution of the environment increase at rates far greater than the rate of population growth. Typically, the use of resource in a modern technological society increases 4–5 times faster than population growth, and the release of pollutants rises in proportion to resource use (Modak 2007). With global market and multinational corporate dominance, the very fabric of cultural diversity is becoming weak and unwoven, spreading the standard model of materialism and consumerism to every part of the globe, changing the perception and aspirations of people who till now lived in relative harmony with nature and had an overall low ecological footprint.

Table 1.1 Transport CO_2 emissions versus population density of cities (Emissions of carbon dioxide (CO_2) per capita from the transport sector, measured in tones per capita versus population density, measured in population per square kilometre (km^2). This is measured across world cities using data from the latest available year in the period 2013–2016) (Source: GHG Interactive Dashboard Data. 2017. London, UK: C40 Cities Climate Leadership Group)

Country	Transport emissions per capita (t CO_2) tones CO_2 per capita	Population density (persons per km^2) persons per km^2
Paris	0.31 t	21,619
Seoul	0.92 t	17,170
Athens	1.58 t	17,027
Barcelona	0.64 t	15,708
Chennai	0.77 t	15,662
Buenos Aires	1.21 t	15,117
Accra	0.35 t	14,597
New York City	1.39 t	10,833
Yokohama	0.94 t	8574
Sydney	0.92 t	8066
Lagos	0.25 t	7506
Milan	0.65 t	7395
San Francisco	2.78 t	7197
Copenhagen	0.96 t	6860
Hong Kong	1.10 t	6585
Tokyo	0.89 t	6071
Mexico	1.76 t	5976
Bangkok	2.95 t	5428
Vancouver	1.74 t	5423
Boston	2.35 t	5356
Basel	0.86 t	5306
London	0.87 t	5277
Madrid	1.04 t	5185
Amsterdam	1.37 t	4991
Stockholm	0.94 t	4912
Chicago	2.96 t	4615
Philadelphia	2.07 t	4456
Toronto	2.34 t	4333
Washington, DC	2.68 t	4255
Montreal	2.38 t	3927
Melbourne	5.76 t	3242
Los Angeles	1.47 t	3200
Johannesburg	1.51 t	2892
Istanbul	0.91 t	2759
Cape Town	1.40 t	1634
Durban	1.87 t	1502
Houston	7.21 t	1442

(continued)

Table 1.1 (continued)

Country	Transport emissions per capita (t CO_2) tones CO_2 per capita	Population density (persons per km^2) persons per km^2
Heidelberg	1.70 t	1436
Oslo	1.25 t	1374
Dubai	3.94 t	654
Portland	3.69 t	635
Venice	2.80 t	632

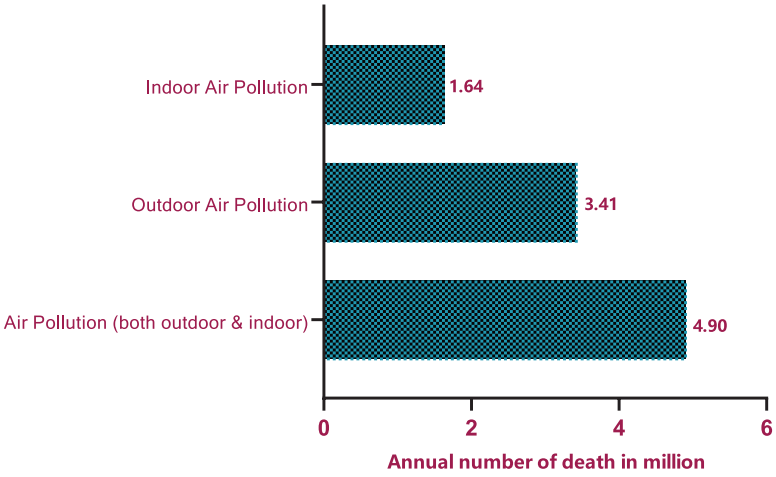

Fig. 1.4 Total annual number of death by air pollution from 1990 to 2017, measured across all age groups and both sexes (Source: http://ghdx.healthdata.org/gbd-results-tool)

The world, especially developing and underdeveloped countries, is heavily burdened with the population explosion. The world human population is currently about 6.5 billion, more than double what it was 50 years ago. A quarter of a million humans are added to the population each day, a population of the size of New York city is added each month and nearly 100 million additional people demand resources each year. This growing human population increasingly impinges on areas that have so far been relatively undisturbed. Population explosion is associated with the pollution problem. With more people, there is more sewage, more solid wastes, more fuel being burned and more fertilizers and insecticides being used to produce more food for hungry stomachs. Actual fuelwood consumption went up from 86.3 million tons in 1953 to about 135 million tons in 1980 in India, indicating the pressure of increasing population growth on forests. In the vast majority of developing and underdeveloped countries, people are directly dependent on natural resources for their basic needs of fuel, shelter and fodder (Modak 2007). It is clear from the comparison of GDP per capita versus population density of various countries (Table 1.2), and the vast majority of the world population and 40% of the Indian population are below the poverty line. They are living in half-starved, ill-clothed and disease-prone conditions.

Environmental degradation and global concerns have little relevance to them. To the very poor, every child is an earner and helper. So the population growth is essentially a result of poverty. The imbalances and inequities in the world are too appealing (Fig. 1.5): More than a billion people live in absolute poverty and hunger in Asia, Africa and Latin America. Seventy per cent of the world's income is produced and consumed by just 15% of the people of the earth. Life expectancy at birth varies from 42 years in Sierra Leone to 79 years in Japan. Literacy rates vary from 30% in Pakistan to over 95% in the United States (Modak 2007). The distribution of the impact of these environmental issues is riddled with serious equity issues. Everyone on the planet is affected by climate change. Agricultural and industrial processes around the world are causing global warming because they are designed to meet the demands of the global market. As a result of global warming, all regions of the world are expected to experience some degree of change. According to climate change predictions, the effects will not be uniformly distributed. Sea level rise will have a disastrous effect on many developing countries, such as Bangladesh, that do not contribute significantly to global emissions. Poor, developing tropical countries will bear a disproportionally large share of the costs of global warming's negative impacts, while more affluent and developed nations in temperate zones will be spared the very worst of its effects. Some belief in a global climate agenda addresses issues of global equity (Philander 2008).

All the developed nations have had a head start in industrialization and economic growth and went on to create vast wealth and infrastructure. They achieved this by freely exploiting their colonies during the colonial era and developing nations during the post-colonial period, creating a chasm between developed and developing nations that is a hard bridge within a short time frame. Most of the greenhouse pollutants were added to our environment by a few developed countries before the newly freed former colonies could even start their industrialization. Even today average carbon footprint of an individual from developed countries is much larger than the individual from developing nations. The alarming rate at which the global temperature is rising and the tell-tale sign of the climate shift are becoming more apparent (Fig. 1.6). Huge emphasis has been put on limiting the global temperature rise at 1.5 °C level in Paris agreement, 2015, and remained at the heart of successive climate summits in the 2019 and 2021 UN climate change conferences. It has become clear that the current rate of greenhouse gas emission and unsustainable practice cannot be maintained, yet how to bring down or even restrict global climate shift remains unresolved mostly due to discord between developed and developing countries regarding the cost of decarbonization. Developed countries have amassed wealth and massive infrastructure on the back of massive environmental exploitation and are now safely poised to switch to greener alternatives, whereas for a developing country, this switch from carbon-based energy and industrial output will surely cause massive strain on their economy and productivity. Most such nations are already reeling under population pressure, unemployment issues and infrastructure shortage. For these nations, losing relatively cheap sources of energy and propellant are not an easy choice to make. It is inherently deceitful to ask developing nations to sacrifice while developed nations who until now have enjoyed the fruit of

Table 1.2 GDP per capita versus population density, 2018 (population density is measured as the number of people per square kilometre of land area. To allow comparisons between countries and over time, GDP per capita is adjusted for price differences between countries and adjusted for inflation – it is measured in international $)

Country	Population density people per km^2 of land area	GDP per capita constant 2011 international $	Total population
Afghanistan	56.94/km^2	$1979	38.93 million
Africa			1.34 billion
Africa eastern and southern	43.43/km^2	$3388	
Africa Western and central	48.11/km^2	$4003	
Arab world	32.09/km^2	$13,754	
Asia			4.64 billion
Australia	3.25/km^2	$48,698	25.50 million
Austria	107.13/km^2	$51,936	9.01 million
Azerbaijan	8120.26/km^2	$13,700	10.14 million
Bahrain	2012.10/km^2	$40,933	1.70 million
Bangladesh	1239.74/km^2	$4818	164.69 million
Brazil	25.06/km^2	$14,064	212.56 million
Bulgaria	64.71/km^2	$22,384	6.95 million
Canada	4.13/km^2	$45,857	37.74 million
Caribbean small states	18.18/km^2	$14,844	
The central African Republic	7.49/km^2	$929	4.83 million
Central Europe and the Baltics	92.69/km^2	$31,329	
Chad	12.29/km^2	$1520	16.43 million
Chile	25.19/km^2	$23,325	19.12 million
China	147.77/km^2	$16,411	1.44 billion
Colombia	44.76/km^2	$13,441	50.88 million
Congo	15.36/km^2	$3449	5.52 million
Europe			748.84 million
Europe and Central Asia	33.45/km^2	$33,278	
Europe and Central Asia (excluding high income)	18.43/km^2	$21,614	
Finland	18.15/km^2	$47,261	5.54 million
France	122.55/km^2	$42,026	65.27 million

(continued)

Table 1.2 (continued)

Country	Population density people per km^2 of land area	GDP per capita constant 2011 international $	Total population
Germany	237.29/km^2	$50,922	83.78 million
Ghana	130.82/km^2	$5305	31.07 million
Greece	83.27/km^2	$27,287	10.42 million
Heavily indebted poor countries (HIPC)	40.31/km^2	$2519	
High income	34.51/km^2	$47,786	
India	454.95/km^2	$6118	1.38 billion
Indonesia	142.57/km^2	$11,445	273.52 million
Iran	50.22/km^2	$12,433	83.99 million
Iraq	88.53/km^2	$9255	40.22 million
Ireland	70.65/km^2	$89,689	4.94 million
Israel	410.48/km^2	$38,341	8.66 million
Italy	202.94/km^2	$38,992	60.46 million
Japan	347.13/km^2	$41,380	126.48 million
Jordan	112.25/km^2	$9817	10.20 million
Kenya	90.30/km^2	$4220	53.77 million
Latin America and Caribbean	31.96/km^2	$15,169	
Latin America and Caribbean (excluding high income)	32.04/km^2	$14,280	
Mexico	64.91/km^2	$17,888	128.93 million
The Middle East and North Africa	40.00/km^2	$15,498	
The Middle East and North Africa (excluding high income)	44.32/km^2	$10,170	
Nepal	195.99/km^2	$3800	29.14 million
Netherlands	511.78/km^2	$54,210	17.13 million
New Zealand	18.61/km^2	$42,404	4.82 million
Nigeria	215.06/km^2	$4917	206.14 million

(continued)

Table 1.2 (continued)

Country	Population density people per km^2 of land area	GDP per capita constant 2011 international $	Total population
North America	20.09/km^2	$58,752	592.06 million
North Korea	212.19/km^2		25.78 million
Oceania			42.68 million
Oman	15.60/km^2	$27,295	5.11 million
Pakistan	275.31/km^2	$4623	220.89 million
Palestine	758.98/km^2	$5394	5.10 million
Philippines	357.69/km^2	$7954	109.58 million
Poland	124.03/km^2	$32,238	37.85 million
Portugal	112.26/km^2	$32,181	10.20 million
Qatar	242.10/km^2	$85,266	2.88 million
Romania	84.64/km^2	$28,833	19.24 million
Russia	8.82/km^2	$26,456	145.93 million
Saudi Arabia	15.68/km^2	$44,328	34.81 million
Singapore	7953.00/km^2	$93,397	5.85 million
Slovakia	113.29/km^2	$30,330	5.46 million
Slovenia	102.99/km^2	$36,548	2.08 million
South Africa	47.64/km^2	$11,466	59.31 million
South America			430.76 million
South Asia	380.33/km^2	$5782	
South Korea	529.19/km^2	$42,251	51.27 million
Spain	93.67/km^2	$36,215	46.75 million
Sri Lanka	350.28/km^2	$12,537	21.41 million
Sub-Saharan Africa	45.21/km^2	$3641	
Sudan	22.60/km^2	$4023	43.85 million
Sweden	24.98/km^2	$50,683	10.10 million
Switzerland	215.47/km^2	$68,393	8.65 million

(continued)

Table 1.2 (continued)

Country	Population density people per km^2 of land area	GDP per capita constant 2011 international $	Total population
Syria	92.28/km^2		17.50 million
Thailand	135.90/km^2	$17,287	69.80 million
Turkey	106.99/km^2	$28,385	84.34 million
United Arab Emirates	135.61/km^2	$67,119	9.89 million
United Kingdom	274.71/km^2	$41,627	67.89 million
United States	35.73/km^2	$60,236	331.00 million

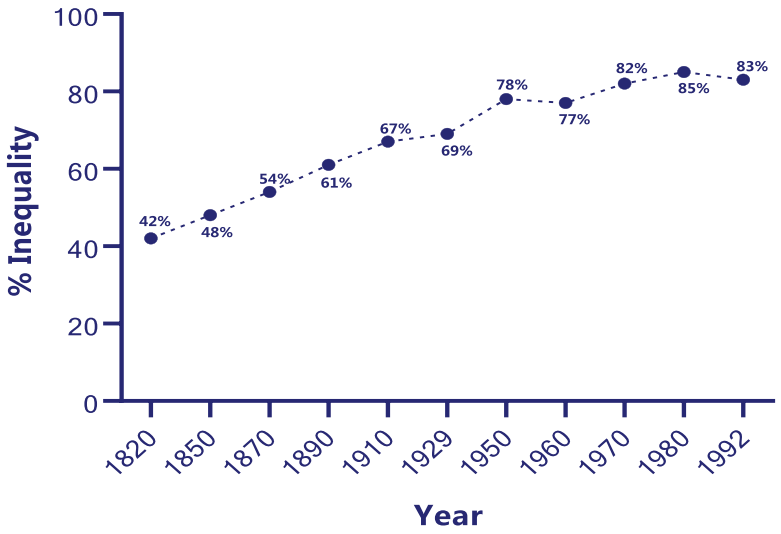

Fig. 1.5 Global inequality between world citizens and its components (1820–1992) (Source: Burguignon and Morrison 2002; Inequality among world citizens)

the same development model are now in a position for a relatively easier transition to greener energy sources. The fact that whether the developed nation should share the economic cost associated with such switching and the question of compensation to developing nations remains a principal cause of discord in the climate summits. These unresolved issues cast a shadow of doubt regarding how sincere global leaders are in restricting an upcoming unmitigated crisis that can doom the whole species.

Impact of unsustainable economic models of development is not restricted to global temperature rise only, and a landmark new report from the Intergovernmental

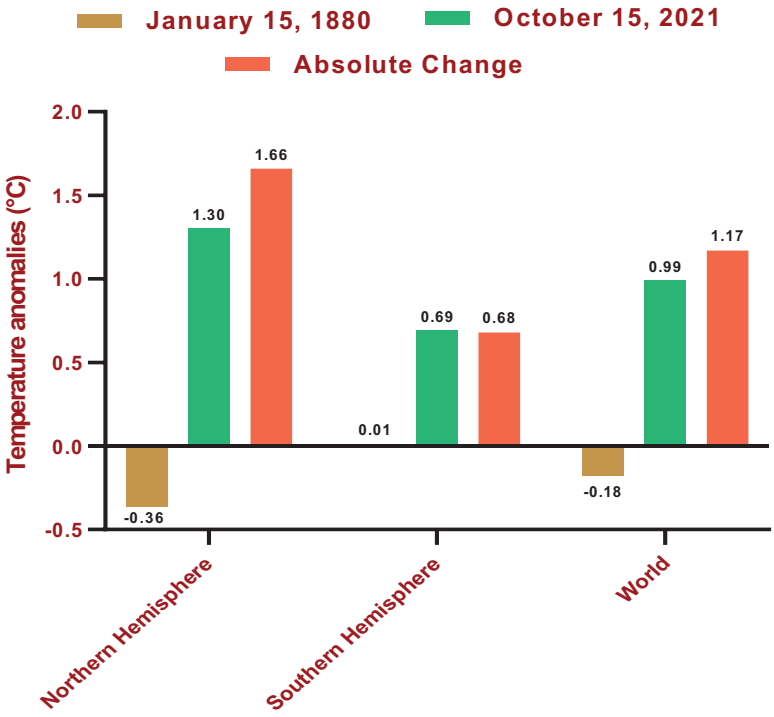

Fig. 1.6 Global warming: The combined land-surface air and sea-surface water temperature anomaly between 1880 and 2021

Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), which was approved at the seventh session of the IPBES Plenary meeting in Paris on 29th April 2019, warns that natural resources and quality of natural habitats are declining globally at rates unprecedented in human history, and the rate of species extinctions is accelerating, with grave impacts on people around the world now likely. For example, agriculture and food productions are major causes of biodiversity loss (Fig. 1.7). An 'ominous picture' is painted by IPBES Chair Sir Robert Watson, based on 'overwhelming evidence' from a variety of disciplines. Watson (2019) said 'Ecosystems, upon which all life depends, are collapsing at an alarming rate. Throughout the world, we are destroying the very foundations that underpin our economies, livelihoods, food security, health, and quality of life'. Most major land-based habitats have seen a decline in native species abundance of at least 20%, mostly since 1900. Almost three-quarters of all reef-forming corals, as well as 40% of all amphibian species and 30% of all marine mammals, are all in danger. Insect species face a cloudier picture, but the evidence we do have points to a 10% threat level. There have been at least 680 extinctions of vertebrate species since the 1600s; by 2016, over 9% of all domesticated mammal breeds used for food and agriculture had gone extinct, and at least 1000 more are still in jeopardy today (UN

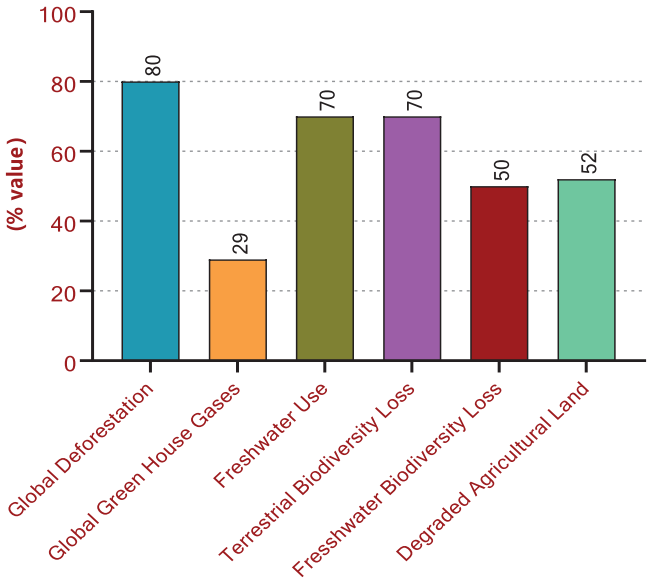

Fig. 1.7 Agriculture and food production are one of the major causes of biodiversity loss (Source: Living Planet Report 2020)

Report: Nature's Dangerous Decline "Unprecedented"; Species Extiction Rate "Accelerating", 6th May, 2019. https://www.un.org/sustainabledevelopment/blog/2019/05/nature-decline-unprecedented-report/). Figures 1.8 and 1.9 present a clear picture of the accelerated species extinction rate post 1900 compared to pre-1900 level.

The disappearance of species and the diminishment of the natural world's biodiversity are now receiving some attention. The loss of indigenous cultures is rarely mentioned concerning this issue. Unless we address the rapid disappearance of indigenous cultures, it is impossible to effectively address biodiversity loss in insects, other animals and plants. For millennia, indigenous peoples have protected the earth's biological diversity. Thousands of crop varieties, livestock breeds and unique landscapes have been created, thanks to their efforts which account for a large portion of the world's agricultural biodiversity. Many of these practices are still in use today, creating new varieties of crops and livestock that are better able to withstand natural disasters than their modern counterparts. Because of this, indigenous lands have seen a slower decline in natural diversity than other areas. This demonstrates unequivocally that the global population ranging from 370 million to 500 million indigenous people play a critical role in conserving biodiversity. This is supported by a wide range of studies. While traditional ecological knowledge is effective in conserving biodiversity and regulating sustainable resource use, it has also been shown to be effective in the practice of pastoralists' animal husbandry and other forms of wild harvest and fishing as well. Nature-based living is at the heart of indigenous peoples' beliefs and values. Indigenous peoples from southern China to

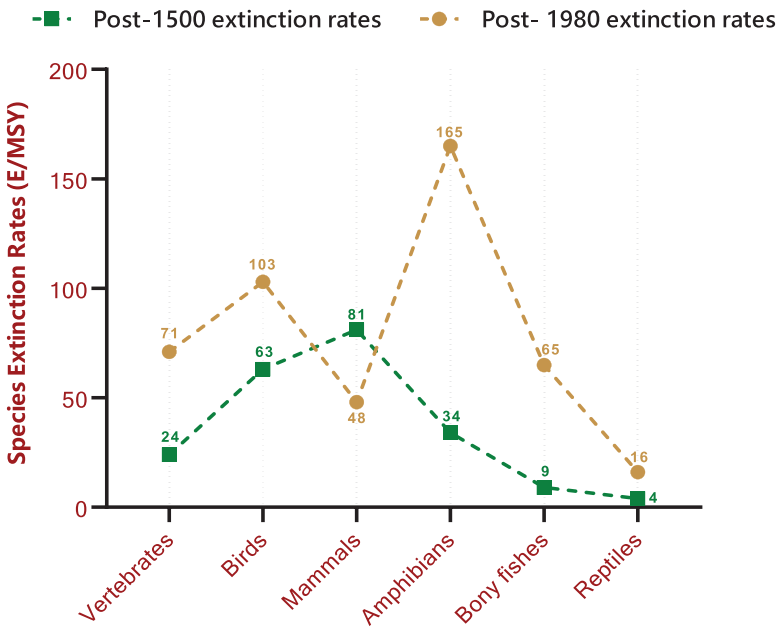

Fig. 1.8 Comparison between extinction rates of species in post 1500 and post 1980 (species extinction rates are measured in extinctions per million species-years, i.e., E/MSY. If the E/MSY was equal to 1, this would mean that if we had one million species, one species would go extinct per year). Source: https://ourworldindata.org/extinctions

the Americas share many of the same ecological values and worldviews. People in the Andes divide the world into three sections: human and domesticated, wild (species, ecosystems and water) and sacred. Instead of focusing on economic growth, their goal is holistic well-being, which is achieved by balancing these three worlds (Swiderska, 2020; https://www.weforum.org/agenda/2020/02/protecting-indigenous-cultures-biodiversity-protection).

1.6 Concluding Remark: Rays of Hope?

The romantic myth of 'noble savage' as envisioned by Jean-Jacques Rousseauthat portrays man as a creature in harmony with nature and content with limited interaction during most of her prehistory, and only the advent of modern society that severed the sacred link between nature and man is mostly debunked now (Pinker 2012). During our discussion, we noticed that since prehistory man overhunted, overgrazed and overexploited the environment whenever there was an opportunity to do so. Eco awareness in its rudimentary form and sustainable resource utilization has been practised throughout history (Spindler 2013) and even now some communities do so (Mazzocchi 2020), but this practice always remained patchy, fragmented,

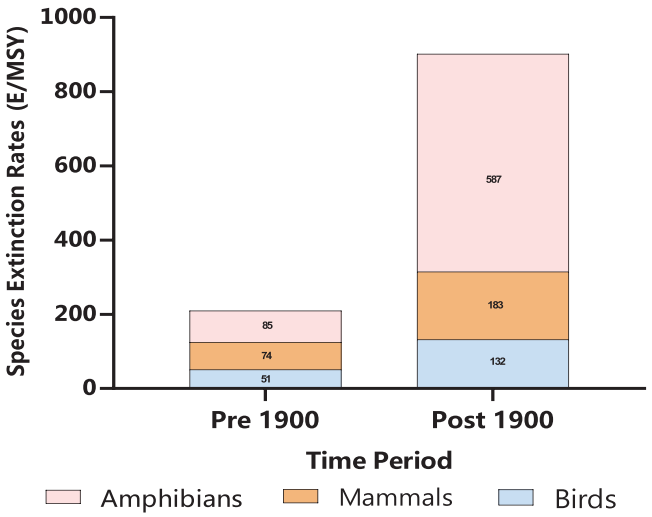

Fig. 1.9 Species extinction rates in pre 1900 and post 1900 (species extinction rates are measured in extinctions per million species-years, i.e., E/MSY. If the E/MSY was equal to 1, this would mean that if we had one million species, one species would go extinct per year). Source: https://ourworldindata.org/extinctions

temporal and localized, and restricted within small communities with low population pressure, limited technological advance and specific religious beliefs. There was no global consensus or agreement between different civilizations and cultures regarding the need for sustainability. As culture conglomerates, mega civilizations were born, the need for resource and development quickly replaced any sustainable practice with more efficient ways for exploiting natural resources. For the most part in our history, human population remained sparse, the level of productivity even for thriving and urbanized civilization remained low, technology remained far less pervasive, resulting in the limited footprint of humans on the environment at the global level, but local environmental crises through deforestation, overgrazing, urbanization and hunting continued to occur. Draught, famine, epidemics and pandemics, loss of species and depletion of soil fertility all continued albeit at a far lower scale than today, but this was not due to lack of intent but for capacity. Before the dawn of the industrial revolution, human technological capacity was simple not at the level where it could impact the global environment significantly. With the industrial revolution global productivity, GDP, development and demand, everything escalated to such a level that there was the positive economic impetus for innovation that continuously increases productivity without any regard to what impact that innovation may have on the global environment. Need for energy that drives industry climbed sharply, leading directly to the present scenario where environmental catastrophe is imminent.

Human nature is driven by the quest for ceaseless progress, ever increased need for sophistication and technological advances that lead to the present global crises,

yet the uniqueness of human culture is quintessentially defined by the ability for constant innovation. Before the age of automobiles, horses were the chief means of transportation in all the metropolitan cities all over the world and streets filled up with horse manure posed a serious threat to health and sanitation. When automobiles become the dominant transportation medium from 1920 onwards, the problem of cities filled with horse manure became obsolete (Dubner and Levitt 2010). Technological innovation solved the century-old problem, but soon automobiles become the principal source of pollution and challenge for health and environment, surely the present problem stemming from globe jam-packed with automobiles will soon be solved with yet other innovations, some of which are already underway. Electric cars and efficient engines along with low pollution propellants and use of renewable and nuclear fuel for energy generation will replace the present infrastructure that relies so heavily on carbon-based energy sources. Surely, innovation will not be free of problems and will bring its hazards, but one thing that will remain constant is the human ability to innovate, which will eventually solve that problem too. Human ability to constantly innovate will not be enough though unless the innovation was consciously designed to be more sustainable, and in this regard, our present time appears to be most promising than ever. There is a global consensus amongst citizens of the world that climate is changing and the path to progress taken by our predecessors is not sustainable, not even in the immediate future. There is a realization amongst world leaders and common people alike that if we continue with our current model of consumption, we as a species are doomed. There is agreement that the environment has been damaged, biodiversity threatened and climate shift is real, people now understand that a species cannot survive in isolation, and anthropogenic effect on the environment, climate and biodiversity will not only cause ecological disaster but will affect our economy, global peace, our life and our livelihood. Never before in our history are we so aware of the irreversible harm that we are causing to our only home, earth. Every innovation, development, or collaboration taking place at the global, regional, or national level now includes a mention of climate-smart adaptation or mitigation strategies because of the growing awareness of climate change's repercussions and the collective responsibility felt towards reversing its effects. Traditional practices that are non-polluting and sustainable, such as those used by indigenous peoples, can help address climate change issues because they are based on indigenous knowledge and practices that have been passed down through generations, rather than new technologies. In the Indian context, this knowledge is particularly useful because the country is home to a large percentage of the world's tribal population and is currently suffering from a diminishing resource base and increasing pollution. By the Indian Constitution, Indian tribal communities have been granted special status, which includes the prohibition of beggars, educational grants, and government assembly reservations. Due to their strong ties to their native environments, tribal communities are the most vulnerable to climate change. Despite these aids, they are still the most vulnerable. A direct benefit would be gained by integrating their indigenous knowledge into scientific systems and making concerted efforts to improve their socio-economic situation (Priyadarshini and Abhilash 2019).

Awareness and efforts to construct an economy and development road map have not remained restricted to productivity and energy generation but the concept has extended to other spheres of human endeavours such as city planning and sustainable neighbourhood construction. The effort to build sustainable alternative neighbourhood projects dates back to the 1970s in Europe and the United States. Their popularity has skyrocketed since 2006. The terms 'eco-districts', 'ecoquartiers', 'ecocities', 'zero/low/carbon/carbon-positive cities', 'ecopolises', 'ecobarrios', 'One Planet Communities' and 'solar cities' are all being used interchangeably these days. In many nations, they have become the primary framework for the construction of new city sections. Additionally, ecourban neighbourhood projects respond to issues and possibilities that are unique to the immediate area in which they are located, and they do so in a variety of ways (Holden et al. 2015). We're seeing an increase in the number of 'eco-cities', 'ecoquartiers', 'ecopolises' (Downton 2008), 'ecobarrios', 'ecovillages', 'one-planet communities' or 'solar cities' around the world. An investigation by Joss et al. (2013) into the concept of eco-cities found that 178 different policies and programmes were in place to promote their implementation. At this point, eco-urban developments are becoming increasingly popular as a set of planning, design, and technical arrangements for living in newly-developed and rejuvenated neighbourhoods. Currently, as many countries throughout the world are seeking aspirational and world-class model sustainable community developments, it is a good time to explore the reasons and trends towards uniformity and fragmentation of planning, design and architecture processes (Holden et al. 2015).

The most promising and heartening aspect of the present time is ecological and climate awareness displayed by the current generation of young citizens of the globe. Young citizens of this generation are not only more educated and aware of anthropogenic effects on the environment but they are increasingly becoming more concerned and vocal regarding these issues and demanding constructive and concerted effort to mitigate this crisis as they realize this is ultimately a question of their future and concerns them most. At the age of 15, Greta Thunberg in 2018, staged a protest outside Sweden's parliament, which garnered national attention. 'School Strike for Climate' was the banner she carried as she demanded the government meet its carbon emissions objectives via her actions. There were hundreds of strikes in countries around the world because of her tiny campaign. She was joined by 20,000 kids from the UK to Japan who skipped school to demonstrate against Trump administration's policies. In what is arguably her most well-known address, she lashed out at international leaders, accusing them of not doing more to combat climate change. 'You all come to us young people in search of hope. How could you? Using your meaningless words, you have robbed me of my childhood and my dreams', she stated (Kraemer, 2021; https://www.bbc.com/news/world-europe-49918719). Through her action, she has ignited a revolution amongst the members of the younger generation who are no longer ready seat quiet and content with the current pace of negotiations amongst global leaders who they consider as dubious in their objective and doubt their sincerity when it comes to climate concerns.

Environmental movements and ecological awareness are increasing amongst all age groups of people and in past 50 years' frequency of protests and clashes between people and corporate and government projects that directly impact environmental balance is increasing. Because of the allure of new consumerist lifestyles, resources are being exploited practically without limit. Nature's symbiotic relationship has been disturbed. This has resulted in several social disputes. It is possible to describe an environmental movement as a social or political movement, either for the preservation or improvement of environmental conditions. 'Green movement' and 'conservation movement' are used interchangeably to describe the same phenomenon. Sustainability in the management of natural resources is supported by environmental groups. Public policy reforms are common themes in environmental movements. Ecological, health, and human rights issues are at the heart of many movements. A wide variety of environmental movements exist, from those that are highly structured and formalized to those that are completely unstructured. Different environmental movements have a diverse geographic span, ranging from local to practically worldwide. There are some major global environmental movements that exist that include the Middle East Conservationists Movement in the 1800s that was founded on conservations, as the eating habits, wars and unfriendly environment made the area difficult to live for both humans and wildlife. Amir Hossein Khaleghi was one of the most renowned conservationists in the Middle East. In the early nineteenth century, the modern environmental movement began in Europe and the United States; it was based on liberalism (a political ideology), and its goal was to safeguard the countryside and animals. In 1914, the first National Park was formed in Europe and Oceania, to conserve biodiversity. In 1923, The Royal Forest and Birds Preservation Society was founded in New Zealand to maintain the ecological balance. The next most notable activity was in Nairobi, Kenya, the Green Belt Movement, which took place in 1977 and was a movement for environmental conservation and social development. Environmental Justice Movement of United States, which is one of the most notable actions, began in 1982 after the then-president chose to send 6000 trucks of soil contaminated with a poisonous material. Another issue that came up was racism amongst people; black people and minorities were looked down upon in their communities. As a result, the goal was to protect the land and other natural resources while also ensuring the safety of the smaller towns. The goal of the Land Care movement in Australia (1986) was to provide wildlife more space and minimize soil erosion; it was also an international platform for green and anti-nuclear activism. Furthermore, the anti-nuclear movement opposed uranium mining; the Friends of the Earth and the Australian Conservation Foundation were active in the campaign. Some of the major environmental movements in India for example during the period 1700 to 2000 include the Bishnoi Movement (1700, Rajasthan) where village lady Amrita Devi could not stand to watch the destruction of both her faith and the sacred trees of her community. They were all encouraged to hug the trees, and she did the same. Bishnoi villagers lost their lives during this uprising, resulting in Bishnoi state being declared a protected area, making it illegal to harm trees or

animals therein. In the region, this legislation is still in place. Another significant eco-movement in India was the Chipko Movement of 1973 in Uttarakhand instigated by Mr. Bahuguna who explained to the locals that trees are an essential part of the ecosystem, as they prevent soil from eroding, provide rain and give clean air. In 1978, the women of the Chipko movement were subjected to police firings and other brutalities, which fuelled the movement's growth. Hemwati Nandan Bahuguna, the then state's Chief Minister, established a committee to investigate the issue, which ultimately sided with the locals. Chipko movement was a watershed moment in the regions and the world's history of eco-development challenges. A large government project aiming at creating a hydroelectric dam over the Kunthipuzha River, which flows through Silent Valley, Kerala, sparked Save Silent Valley Movement in 1978. It was feared that 8.3 km^2 of undisturbed damp evergreen forest would be submerged by the project. Numerous NGOs opposed the project and lobbied the government to scrap it. They were successful. Indira Gandhi announced in January 1981 that Silent Valley will be conserved in the face of public outcry; the Silent Valley Hydroelectric Project was terminated in November 1983. The Silent Valley National Park was formally established by Prime Minister Rajiv Gandhi in 1985. Another stirring environmental movement termed as Tehri Dam Conflict (1990, Uttarakhand) drew widespread public interest. It was feared that the construction of the dam will cause Tehri town to be submerged, as well as forest lands and Tehri's outskirts, amongst other concerns (ClearIAS Team, 2021, https://www.clearias.com/environmental-movements-in-india/).

Thus, it is clear from our discussion that concerns regarding the state of our environment and the ensuing conflict with projects that has the potential to cause large-scale environmental perturbation are becoming regular. Not only people are becoming aware of climate change and the effect of the mega project on their life and livelihood, but they are also becoming concerned with perturbation to the ecosystem, deforestation and loss of biodiversity. In the past, climate change-influenced biodiversity projections have been focused on a narrow methodology, but new, integrated science is emerging based on a variety of sources and techniques (Dawson et al. 2011). Climate change forecasts have sparked a wide range of policy responses, from local to global (Phillimore et al. 2010). Because greenhouse gas emissions have already caused significant climate change, the potential for biodiversity loss and the disruption of ecological services must be addressed seriously. Biodiversity protection will necessitate immediate effort and long-term planning for the years and decades ahead. Based on these empirical niches (or climate envelope) models, climate change consequences on biodiversity are currently being assessed (Guisan and Thuiller 2005). These simulations show that for the vast majority of species, massive regional shifts and widespread extinctions are predicted. Only one facet of vulnerability, exposure to climate change, can be identified by niche models. Climate change's impact on biodiversity is a complicated issue that requires consideration of all aspects of susceptibility, exposure, sensitivity and adaptive capacity (Williams et al. 2008).

As climate change is tracked in real-time, new information is uncovered, but direct observations alone cannot predict hazards or the ability of species and communities to adapt. It's not clear whether species populations will be able to adapt to the changing environment. Novel combinations of climate variables will be seen in future ecosystems (Gill et al. 2009). Mechanistic models and observations show that many species populations can adapt to climatic change in situ via phenotypic plasticity and microevolution (Visser 2008; Baker et al. 2004; Phillimore et al. 2010) and that many populations can disperse locally to suitable microhabitats (Davies et al. 2006; Thomas et al. 2001). To reestablish communities that are already lost or threatened beyond recovery, intensive intervention options include substantial habitat management, assisted migration and transfer of species outside of their native ranges (Hoegh-Guldberg et al. 2008). To restore important habitat types and whole communities, populations that are still thriving in other areas can be reintroduced to the affected area. Cryogenic seed banks have also recently been developed for cryogenic seed conservation, which may help save species or populations for future release or reintroduction. The tactics that are used and the resources these processes demand will vary depending on the circumstances of the species. Habitat restoration and preservation and removing anthropogenic pressure other than the global rise in temperature will continue enhancing species and ecosystems' ability for coping with climate change. More informed approaches will necessitate additional research, particularly focusing on identifying critical ecological and evolutionary variables and developing models capable of offering solid forecasts. Throughout history, from the dawn of human culture to the establishment of modern human society, the human–nature interface remained fluid and dynamic relationship. Current realization and understanding that unrestricted alteration of surrounding and destruction of fine ecological balance will eventually remove the dominant species no matter how technologically advanced they are and how they have imbibed us with renewed urgency to mitigate and reverse the effect of human activities that became more and more unsustainable as civilization progressed. We have to remember that earth is not in danger but we are, the ramification of our actions will deteriorate the chance of our survival, and as soon as our species become extinct, the earth will restore balance. The earth shall recover, ameliorating whatever perturbation the Anthropocene has caused in a matter of centuries, ultimately making the age of humans a temporal blip in the long history of the earth that has seen the rise and fall of numerous dominant species. One glaring contrast will be, while every other dominant species became extinct due to random evolutionary process, or as cost of overspecialization or inevitable climate cycles of earth or shear random accident like getting hit by an asteroid, we might become the first species that will go extinct because of our conscious alteration of the environment. We are the only species with technology advanced enough that can bring about global climate change and ecological destruction. Our extinction could well be due to our progress, and it will be particularly sad because we have been warned and that too for a considerable period of time.

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