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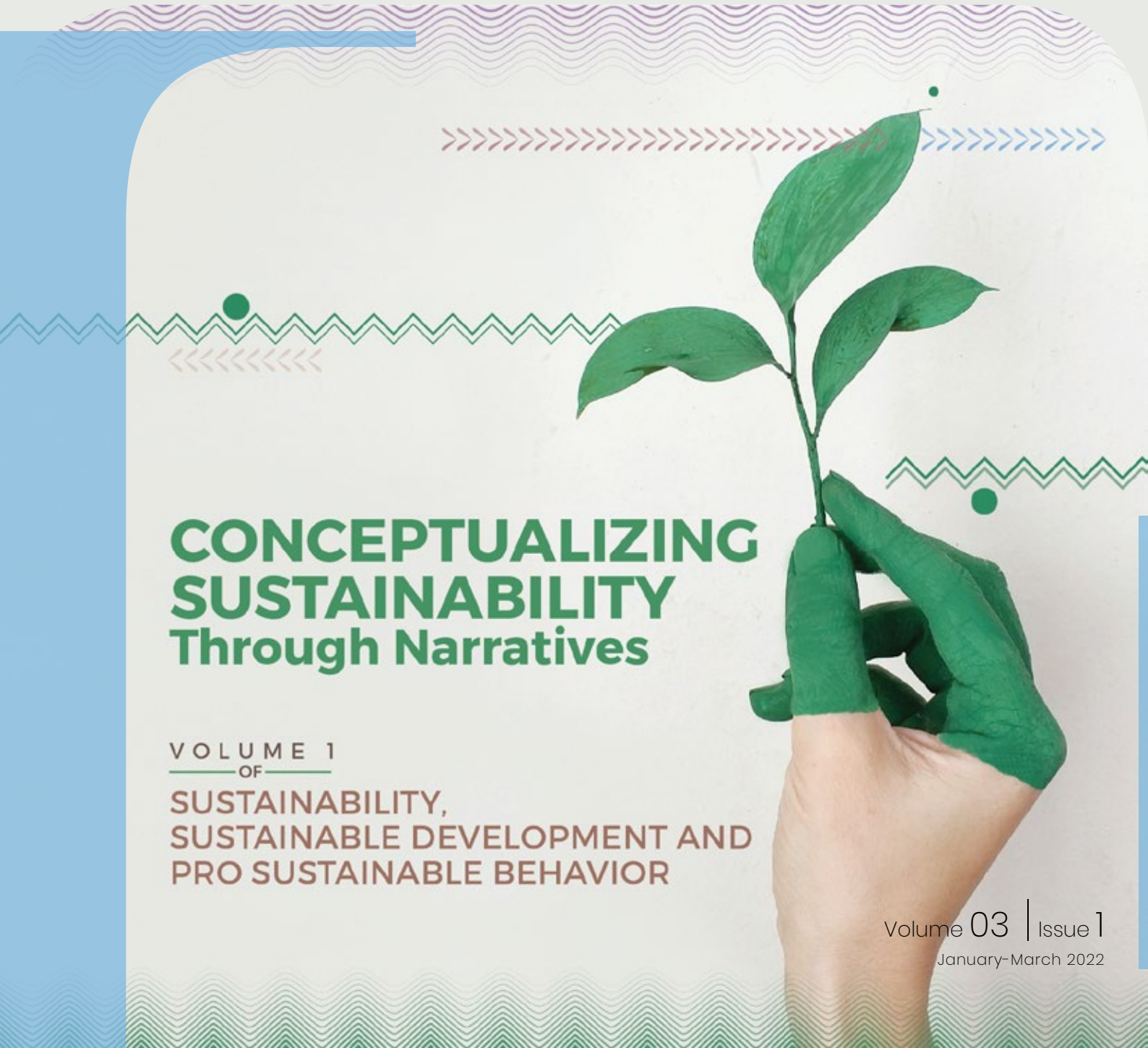
QUARTERLY • A Free Open Access Peer-Reviewed Interdisciplinary Quarterly Journal of the University of Mumbai



CONCEPTUALIZING SUSTAINABILITY Through Narratives

VOLUME 1
OF
SUSTAINABILITY, SUSTAINABLE DEVELOPMENT AND PRO SUSTAINABLE BEHAVIOR

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S a m b h ā ṣ a ṇ

A Free Open Access Peer-Reviewed Interdisciplinary Quarterly Journal

On the occasion of Dr. Babasaheb Ambedkar's 129th birth anniversary on 14th April 2020, the Office of the Dean, Faculty of Humanities, University of Mumbai has launched a free open access online journal, Sambhāṣaṇ. This interdisciplinary journal hopes to bring diverse disciplines in dialogue with each other through critical reflections on contemporary themes.

Note on part of the image on the cover:
Hand holding a Leaf Photo by Alena Koval: https://www.pexels.com/photo/person-s-left-hand-holding-green-leaf-plant-886521/

Sambhāṣaṇ or conversation as an art of dialogue has been crucial to the development of both Indian and Western thought. Dialogos in Greek literally means "through word", where one establishes relationships on the basis of conversations to initiate processes of thinking, listening and speaking with others. Thinkers such as Mohandas Karamchand Gandhi, Rabindranath Tagore, Sarojini Naidu, David Bohm, Hans Georg Gadamer, Anthony Appiah and Martha Nussbaum have projected shared dialogue as a way of understanding the relationship between the individual and society. While Jyotiba Phule, Savitribai Phule, Bhimrao Ramji Ambedkar, Pandita Ramabai, Jürgen Habermas, Paul Ricoeur, Patricia Hill Collins and Judith Butler, to name a few, have started out anew through ruptures in conversations. The inevitability of conversation in academic life emerges from its centrality to human development and ecology. Conversations are not restricted to any single territory, but are enacted between global and the local topographies. This online English Journal aims at continuing and renewing plural conversations across cultures that have sustained and invigorated academic activities.

In this spirit, Sambhāṣaṇ an open access interdisciplinary peer-reviewed online quarterly journal endeavours to:

- be an open platform, where scholars can freely enter into a discussion to speak, be heard and listen. In this spirit, this journal aims at generating open conversations between diverse disciplines in social sciences, humanities and law.
- preserve and cultivate pluralism as a normative ideal. Hence, it attempts to articulate a plurality of points of view for any theme, wherein there is both a need to listen and to speak, while engaging with another's perspective.
- act as a springboard for briefly expressing points of view on a relevant subject with originality, evidence, argument, experience, imagination and the power of texts. It hopes that these points of view can be shaped towards full-fledged research papers and projects in the future.

Framework

- This journal is open to contributions from established academics, young teachers, research students and writers from diverse institutional and geographical locations.
- Papers can be empirical, analytical or hermeneutic following the scholarly culture of critique and creativity, while adhering to academic norms.
- Commentaries and reviews can also be submitted.
- Submissions will be peer-reviewed anonymously.
- Some of the issues will publish invited papers and reviews, though there will be a call for papers for most issues.
- There would be an occasional thematic focus.

Guidelines for Submission

- Original, scholarly, creative and critical papers with adequate references.
- All references to the author should be removed from the submission to enable the anonymous review process.
- There can be a limit of approximately 3500-4000 words (for papers) and 1500-2000 words (for commentaries) and 1000-1200 words (for reviews).
- Essays should follow the Times New Roman font in size 12 with double space, submitted in MS Word format.
- All contributions should follow the author-date referencing system detailed in chapter 15 of The Chicago Manual of Style (17th Edition). The style guidelines in this journal can be consulted for quick reference.
- Authors should submit a statement that their contribution is original without any plagiarism. They can also, in addition, submit a plagiarism check certificate.
- The publication of research papers, commentaries and book reviews is subject to timely positive feedback from anonymous referees.

Publisher

Office of the Dean of Humanities, University of Mumbai, Ambedkar Bhavan, Kalina Campus, Vidyanagari, Mumbai-400098

This journal accepts original essays that critically address contemporary issues related to social sciences, humanities and law from an interdisciplinary perspective.

“In an ideal society there should be many interests consciously communicated and shared... In other words there must be social endosmosis.”

Dr. B.R. Ambedkar

Editorial Note

Reorienting the Human-Nature Relationship through Reflections on Sustainable Narratives!

The relationship between human life, with its attendant needs, habits, artefacts, aspirations and the like, termed as civilization and nature is a deeply contested issue. This is especially so because the interventionist character of technology (since the modern industrial revolution) has led to an endless chain of crises such as deforestation, land degradation, global warming, loss of bio-diversity, climate change, ozone depletion, waste production..., all of which are impressions of the ever increasing *Homo sapien* footprints. Although the arrival of an Anthropocene Epoch, following geologist Jan Zalasiewicz, remains debatable, there is undoubtedly a pronounced alteration caused by human beings to the natural sphere of the earth, along with its resources, life and climate. Almost 27 years ago, Gadgil and Guha have described how satellite images of the "bird's eye view" (1995, 1)

of the earth reveal gigantic ecological shifts where natural land mass, foliage and even non-human life have been gradually turning into human made artefacts (1995, 1-3). Thus, "...trees, shrubs and grasses are giving way to plantations and crop fields, roads and buildings; where rivers are being increasingly impounded with waters diverted through underground tunnels to turn giant turbines or merely being disciplined to flow along paths straight and narrow; where old wetlands are being drained and new ones created in the form of waterlogged fields" (Gadgil and Guha 1995, 1). Such a radical transformation has made sustainable existence a challenge, as the escalating environmental crisis indicates. Gadgil and Guha have aptly noted that the "worm's eye view" (1995, 1) can comprehend how seismic ecological shifts are manifested as crises. The latter can be documented by walking through cities and villages to understand how ecological changes are affected by and affect the social world. They observe how such walks through rural and urban India, for example, reveal the lack of availability of natural resources that inhibits livelihoods; thus, without fertile land, farmers face a crisis, the lack of fish affects fishing communities, the urban poor is bereft of decent shelter. Hence, "If the bird's-eye view revealed a picture of considerable ecological change, the worm's-eye view converts that image into one of serious ecological crisis" (Gadgil and Guha 1995, 2). The various dimensions of ecological crisis have displaced the eco-system people to ecological refugees and much of the artefact civilizational culture benefits the omnivores.[1] Given the colossal crisis confronting the human-nature relationship, the goal of sustainable living has been a critical since the 20th century, if not even before that. Yet as Gadgil and Guha noted decades ago, one cannot simply confine oneself to a blame game of holding only individual actors such as the World Bank responsible, as the Narmada Movement did; nor can one limit oneself to exclusively criticizing abstract forces like capitalism in the spirit of ecological

1 This distinction between omnivores, eco-system people and ecological refugees is derived from Gadgil and Guha (1995, 4).

Marxists. Rather, challenges to sustainability arise from an exploitative mixture of elite consumption, free markets and militarism that disregard local communities to advance human foot print on nature (Mahadevan 2013, 81). Such a footprint is the outcome of a conception of the human being as transcending nature, while at the same time being able to exploit its resources with impunity! Consequently, there is a deracination of eco-system people, such as the tribals who live in forests, leading to the formation of ecological refugees. The search for sustainability has to highlight social movements and world views that champion a non-sovereign notion of the human being as living in cooperation and responsibility with other human beings and nature itself.

In this endeavour, one needs to turn to philosophies and world views that reorient and integrate human beings with nature, to restore and reshape their equilibrium. Such a reflective turn- the need of the hour- will help in igniting a consciousness change from overconsuming nature to dwelling in it. There is potential for articulating such balances from a spectrum of philosophical positions from the ancient period to the contemporary that uphold human beings to be a part of nature. They differ from positions that emphasize the transcendence of the human over nature and consequent imbalances. Thus, the Epicureans, Stoics and Buddhists, for instance, cannot be defined as exclusive environmentalists in a deep ecological way. However, they provide unlikely resources for widening the horizons of a sustainable and ecological outlook. From the position of human immanence in nature, they advocate living in accordance with nature, rather than apart from it. Human life does not have value outside of the larger ecologies of life; it is through the acknowledgement of the interdependence of human and other forms of life (and nonlife) that a state of well-being can be attained. For Epicureans and Stoics, human flourishing is of prime significance (Bett 2006; Morel 2006). On the other hand, Buddhists consider the cessation of pain or *duḥkha* to have a normative role (Keown 1996, 44-56;

2006, 9). Yet, neither the attainment of pleasantness (Epicureans), happiness (Stoics) nor the cessation of suffering (Buddhists) is possible by transcending nature and establishing the sovereignty of the human being. Rather, flourishing or cessation of suffering requires learning how the human being is a part of nature, while finding its place in natural rhythms. Hence, these schools of thought give predominance to studying and understanding nature as a normative endeavour. Consequently, they can redirect the equilibrium of the human-nature relationship from the dominant anthropocentric orientation. Epicureans, Stoics and Buddhists do not, however, have homogeneous conceptions of nature. The Epicureans root determinate physical nature in an infinity of atoms and void; as one of the many infinite determinations in the cycle of production and destruction without ultimate meaning (Morel 2006). The Buddhists uphold the cycle of dependent origination (*pratītyasamutpāda*) where everything is interconnected with everything else and nothing is absolute; worldly events are in a constant process of birth and destruction impacting each other without any absolute point of departure (Anālayo, 2020). Although, the Stoics, did uphold a notion of an ultimate end happiness(unlike the Epicureans or Buddhists), they saw it as both an adaptation to the larger cosmic need, while at the same time unique to the inherent constitution and functions of each being. Following Heraclites, the Stoics believed that the universe had a divine rational pattern that has to be adhered to (Bett 2006). However, for Epicureans, Buddhists and Stoics an engagement with nature requires both, the mediation of comprehending the scientific foundations of nature (to be rid of fears and superstitions), and its affective impact on human beings. Such knowledge for them brings about a consciousness change to impact the emotive dimension of human beings. The Epicurean pleasant life, the Buddhist life without suffering and the Stoic happy life all require tuning in to nature and being impacted by it, in the process of understanding it.

In the modern context, Jyotiba Phule, as Gadgil and Guha note, who belonged to the eco-system people (1995, 188), has critiqued the organized institutionalisation of forests that led to exploitation of forest land and the takeover of peasant lands, which in turn led to the alienation of ecosystem people from sustainable living (Phule 1883). He has also critiqued the colonial government for its exploitative approach to forests. To quote Phule, "...the cunning European employees of our honourable government have spent all their foreign and multi-faceted intelligence to establish a massive Forest Department; including all mountains and hills and valleys. This culminates in the inclusion of unused lands and the town pastures as well. Now our poor and handicapped farmers' sheep and goats have no place to feed even on air in the forests. Now if they want to fill their bellies they have to work in the factories as weavers, iron-smiths or carpenters or as casual labourers;(Phule 1883)." Similarly, M.K. Gandhi's philosophy has analogous prospects for ecological consciousness change, although -unlike Phule- he has not written directly on environmentalism. Gandhi has inspired many environmental movements in India (Gadgil and Guha 1995. ; Lal 2019) and deep ecologists like Arne Naess. As "a thinker with a profoundly ecological sensibility" (Lal 2019), Gandhi critiqued conspicuous consumption and its human centric model of progress. He propagated simple cooperative living based on the principle of sarvodaya where individual well-being is closely related to collective due to the interdependence between all living beings. Thus, Gandhi proclaims "I DO not believe...that an individual may gain spiritually and those who surround him suffer... I believe in the essential unity of man and, for that matter, of all that life. Therefore, I believe that if one man gains spiritually, the whole world gains with him and, if one man falls, the whole world falls to that extent" (Gandhi 1924, 408). This makes the transcendentalism of stepping outside the domain of nature to control it violent. As Lal notes, Gandhi upheld that nature should be allowed to flow its way, curbing it was precisely why crises of floods and famines occurred. For Gandhi, "The earth is not merely there to be

mined, logged and hollowed out" (Lal 2019). The *van panchayats* of Kumaon, in what is now Uttarakhand, were formed in 1931, as a result of peasant resistance movement against exploitative control over forests by the British government in 1921 (Gadgil and Guha 1995, 169). The British had to relent their predatory approach to the forests – but only to an extent- and allow local communities to enter sustainable forest management. However over a period of time the amendments to Indian Forest Act in 1976, 2001, 2005 and 2012 (which governed the formation of *van panchayats*) diluted the *van panchayats*. They have become bureaucratized, while also being deprived of funding and power (Azad, 2021). Learning from Phule and Gandhi, the rising forest fires in Uttarakhand could be doused by following the wisdom of the villagers of Uttarakhand, the ecosystem people.

Phule's and Gandhi's critique of Western colonialism is also relevant in the context of the double-standards underlying the global North's perspective on sustainability. Thus for example, Norway deflects attention from its Arctic drilling that weakens its ecosystem and its dependency on fossil fuels, while at the same time advocating the preservation of rain forests in Brazil (Magassy 2021). From a Gandhian point of view, there is an absence of morality in such a model of progress that only accelerates bodily needs, while serving the interests of neo-colonial forces (Gandhi 2010, 32).

One could avert the plight of ecological refugees by learning from the eco-system people such as Phule and philosophies and world-views that resonate with the Buddhists, Epicureans, Stoics and Gandhi, among others, in myriad ways. However, one has to appropriate them critically and contextually. As Gadgil and Guha note, there is "... a strain of constructive social activism and critical enquiry that runs deep in Indian culture" (1995, 188). Such kinds of activism and critique have influenced environmental movements in India that have highlighted the crisis of sustainability. Learning

from the eco-system people, ecological movements in India bring out interconnecting bonds that characterise life on earth; environmentalists and eco-system people show how these bonds are severed when human beings convert everything to artefacts. This can be characterised extending Guha's and Martinez Alier's "environmentalism of the poor" (1997, 18) as the sustainability of the poor. Such a sustainability has the harmony between human beings and resources as integral to sustainable living. It is from this perspective that Gadgil's Western Ghats Ecology Report mentions the "participation of local communities, a process that has been termed *adaptive co-management*" (Gadgil 2021, 15) as a way of developing sustainably and ecologically. Rather than think of sustainability as a regulatory order of the law, one needs to adopt a deeper grassroots notion of sustainability, as emerging from world views, eco-system people and interdependent lives.

In this spirit, the authors in the first part of this issue conceptualise narratives of sustainability in the contexts of its history and culture (M.H. Qureshi), mental health (Dave Sookhoo), law (Virendra Kumar), education from the geographic and architectural perspectives (Samruddhi Patwardhan and, Pravin Kokane) and oceans (Nitin Agarwala). The second part of this journal issue explores concrete case studies of sustainability with Tiakala Ao's and Narayan Sharma's engagement with sustainable agriculture in Nagaland; Srikumar Chattopadhyay's account of Kerala's route to sustainability; Anuradha Majumdar and Shantanu Majumdar's essay on the beacon of hope of green spots in Mumbai; Maharashtra, Nabila Khan's and Lata Dyaram's piece on sustainability in the Indian context; Tanushree Sharma's Tithi Bhatnagar's and Drishti Kalra's analysis of sustainability in the architectural domain and Namita Nimbalkar's and Medha Tapiawala's delineation of sustainable beliefs of the Warlis and Kolis in Palghar and Thane, Maharashtra. The book reviews by Bhagyashree Patil and Amit Ranjan take forward the theme of this issue in creative ways. We mourn the loss of India's influential

environmentalist Sundarlal Bahuguna, as we think through his legacies in different ways with the obituaries by Pratiba Naitthani and Aparna Phadke.

This issue on *Sustainability* has been possible because of the support we have received from the authors who have contributed research papers and the expertise of peer reviewers who adjudicated them. We express immense thankfulness to all our well-wishers and are pleased to announce that as of January-March, 2022 Quarterly issue of *Sambhāṣaṇ* now possess an ISSN number. Our gratitude to the authors and peer reviewers of this issue! Our Vice Chancellor Prof. Suhas Pednekar and Pro Vice Chancellor Prof. Ravindra Kulkarni have continued their generous encouragement to *Sambhāṣaṇ* as a space for intellectual endeavours. Our profuse thanks to them! Our Dhanyavaad to our team of Assistant Editors for their meticulous copyediting. We thank Ms. Prajakti Pai for her brilliant and imaginative layout. Shukriyaan to *Sambhāṣaṇ* Editorial Team for valuable suggestions. We put on record our thanks to Mr. Sanket Sawant of the University of Mumbai's DICT Team under the guidance of Dr. Srivaramangai, Director of DICT for readily uploading the journal, going beyond the call of duty.

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who are committed to
Sustainable Development.

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SECTION I

CONCEPTUALIZING SUSTAINABILITY

SECTION II

STUDIES OF SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT

REVIEWS

OBITUARIES

Section I

CONCEPTUALIZING SUSTAINABILITY

Culture And History Of Sustainabilty

M. H. Qureshi

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Culture and the question of sustainability, both have moved together within the space occupied by human beings living in a society. Culture is the composite achievement of human societies which has continuity as the traits are transferred from one generation to the other. One of the early definitions of culture was given by Edward Burnett Tylor in his book entitled "Primitive Culture" in 1871. He defined culture as, "*that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man(human) as a member of society*." Cultural attainments are the collective and composite attainments of the people of a society. The people in different ecological niches strove for their sustainability by identifying the means of sustenance over the terrestrial space which they occupied. Thus, the cultural development and the development of means of sustainability over the space became intertwined together. It is imperative for human society to select activities that are responsible for sustaining it. The question of whether the concerns for sustainability came first and culture later or vice versa is not relevant, as both, sustainability and culture, are the attributes of human societies. Both are related to space and time. Hence, both are bound to develop together. It is said that it is important to know what we produce, but it is still more important to know with what tools production takes place. These tools, however primitive they may be, represent the stage of our development of material culture. Material culture is the result of the creativity of the members of society and the utility of the materials in the

process of production. Human beings have been created with a lot of creativity provided by nature and use it for further creation.

Human beings, in the initial stages of their appearance on the surface of the earth, searched for the resources for their sustenance within their ecological niche. In the primitive stages of their economic history, they depended, for their food, on the resources available in their immediate environment. They survived on the collection, and gathering of roots, barks, and fruits of plants and on the hunting of animals. They used primitive tools such as stones, sticks, twigs, and bones, which formed their material culture, however, primitive or ordinary those might have been. The population was lower; hence the damage to the environment was not discernible. They depended on whatever was available within their ecological surroundings. It is also possible that they used to collect some grains from a few plants in the diverse surroundings and ate them. The main consideration was that these food items available from the environment provided energy and were not bitter in taste. They also depended on hunting the available animals, birds, and fish with the help of very ordinary tools. With the growth of the population and a resultant increase in its size, the capacity of the ecological niche to sustain the population became limited. It was important to know what materials they gathered but culturally it was more significant to know the tools and techniques used in obtaining these materials of subsistence. The productivity of labor was low, and cultural attainment was also at a low level.

These activities, such as gathering and hunting adopted by the people at that time were tiresome and productivity, generally, was low, which resulted in scarcity and hunger. The economic activities adopted at that time were destructive in nature, and the surrounding environment was progressively being eroded of its resource base, so it was feared that it would not be able to sustain the population for long. The growth of the population required a larger area to sustain itself and accommodate the increasing numbers of people. The spatial area of operation increased and their movements over the space also became more frequent. There was not only one center on the surface of the earth where human beings appeared. A situation might have arisen when two or more communities, once located apart, came face to face, and conflicts might have ensued. The space was, thus, contested between communities. The lack of carrying capacity of

the ecological surroundings and avoiding intergroup conflicts might have been the reasons that forced people to move away from the destructive economic activities of collection, gathering, and hunting to the economic activities of domestication. Destruction was replaced by domestication, the movement was abandoned, and sedentary settling was preferred. The process of villagization would have started with the clustering of houses, huts, and shanties. It was not only the grains that sustained the people but the domestication of animals also provided food in the form of milk and meat. They also provided hair, wool, and hides for making cloth, shelters and other usable materials.

The domestication of animals seems to have taken place first. "The dog was the first to be domesticated (Larson et al, 2012) and was established across Eurasia before the end of the Late Pleistocene era, well before the cultivation of crops and before the domestication of other animals." Herding, in the steppe lands, might have been adopted first, entailing the movement of people along with their herds of sheep and goats from one pasture land to the other.

The process of settling down at a place, started giving rise to small settlements and rural societies with agricultural activities and animal husbandry, ushered in the era of domestication of both plants and animals. There emerged a number of centers where agriculture was started in historical times.

Ancient knowledge about grains ensuring sustainability:

Edible grains were obtained from the bio-diverse ecological niche by selection and experimentation. Their selection was slow due to experimentations of the people. A number of grains have been mentioned in the *Yajurveda*- an ancient Indian text, which was written, perhaps, between 12,000 and 10,000 B.C.E. These different grains, which were known at that time, have been mentioned in Shloka No. 961 in the 18th chapter as under:-

"*We perform Yajna so that we are blessed with Breeh (rice), Barley, Mash (Urad), Sesamum (Til), Moong, Gram (Chana), Kangni (Fox tail millet), Mandua (Finger*

millet) Sawan /sama (Barnyard millet) Newar (Dinkal wheat), Wheat and Masur (lentil). (Translated by Bhagwati Devi Sharma),

Food as a source of sustenance has been emphasized in the following statement in *Taittriya Upanishad,"(He) learnt that food is Brahma (because) from food these creatures are born; Having been born by food and having departed into food again they enter."* (Swami Sarvanand, 1921).

Almost all the food grains mentioned in *Yajurveda* are still cultivated in one part or another of the country. According to historians the domestication of wheat goes back to about 12,000 B.C.E from a plant known as "**emmer**" which is a surviving ancestor of wheat. Archaeologists also confirm that modern wheat was cultivated in the Karacada mountain region of Southeast Turkey. The findings of historians and archaeologists corroborate with the description of wheat (*godhoom* in Sanskrit) mentioned in the *Yajurveda*. The archaeologists, anthropologists, and plant scientists searched for the geographical spread of grains and other animal-based economic activities. The story of the emergence of cultural elements was also unfolding with the economic development.

Vavilov (1935) identified 8 core areas where agriculture was adopted as an occupation. These were:

I. The Chinese Centre - He recognizes 138 distinct species, of which probably the earliest and the most important were cereals, buckwheats and legumes.

II. The Indian Centre (including the entire subcontinent) - based originally on rice, millets, and legumes, with a total of 117 species.

IIa. The Indo-Malayan Centre (including Indonesia, Philippines, etc.) - with root and fruit crops, sugarcane, spices, etc., some 55 species.

III. The Inner Asiatic Centre (Tadjikistan, Uzbekistan, etc.) - with wheat, rye, and many herbaceous legumes, as well as seed-sown root crops and fruits, some 42 species.

IV. Asia Minor (including Transcaucasia, Iran, and Turkmenistan) - with more wheat, rye, oats, seed and forage legumes, fruits, etc., about 83 species.

V. The Mediterranean Centre - of more limited importance than the others to the east but including wheat, barley, forage plants, vegetables, and, fruits-especially spices and ethereal oil plants, some 84 species.

VI. The Abyssinian (now Ethiopian) Centre - of lesser importance, mostly a refuge of crops from other regions, especially wheat and barley, local grains (such as **teff**) and coffee, and spices such as onion, garlic, and chillies, etc., about 38 species.

VII. The South Mexican and Central American centre - important for maize, *Phaseolus* and Cucurbitaceous species, with spices, fruits, and fibre plants, with some 49 species.

VIII. South America: Andes region (Bolivia, Peru, Ecuador) - important for potatoes, other root crops, grain crops of the Andes, vegetables, spices, and fruits, as well as drugs (cocaine, quinine, tobacco, etc.), some 45 species.

VIII a. The Chilean Centre- only four species - outside the main area of crop domestication, and one of these (*Solarium tuberosum*) derived from the Andean centre. This could hardly be compared with the eight main centres.

VIII b. Brazilian-Paraguayan Centre - again, outside the main centres with only 13 species, though cassava and peanut are of considerable importance; others, such as pineapple, rubber, cacao, were probably domesticated much later.

Culture and Sustainability:

We cannot think of the development of culture, independent of the livelihood, habitat, and daily chores of the human beings in their respective societies. It becomes clear when we identify the indicators of culture. The habitat, food, clothing, mediums of expression, faith, festivals, rituals, etc., decide the variations in cultural attributes over space. We know that language is an incomplete medium of expression. All the feelings, emotions, and expectations cannot be expressed through language. We require different other mediums besides language to express ourselves. Hence, other mediums of expression such as music, dance, drama, painting, and architecture. All these cultural forms vary over space depending upon the variations in different elements of nature and the ecological richness of the region. For example, the climatic conditions result in the variation in our clothing, food, house types, occupations and means of transportation. The

ecological parameters help in the adaptation and modification of the system of sustenance in a society.

The sustainability of human beings, thus, gets intertwined with the produce obtained from agricultural crops and animal life. It is said that human beings do not live by bread alone. They have to satisfy their basic needs along with their higher needs. Thus, along with their concerns for sustainability, they were also involved in creating material (tangible) as well as nonmaterial (nontangible) cultural elements. The cultural attainments of a society change with the level of technological - development. The interactive system of naturalized humans and humanized nature ensures livelihood and sustainability in society. Human beings have to attend to the higher needs of life. This fact led to the development of philosophy, language, and many other nontangible cultural elements. Banks & McGee (1989) opined that "*the essence of a culture is not its artifacts, tools, or other tangible cultural elements but how the members of the group interpret, use, and perceive them. It is the values, symbols, interpretations, and perspectives that distinguish one people from another in modernized societies; it is not material objects and other tangible aspects of human societies. People within a culture usually interpret the meaning of symbols, artifacts, and behaviours in the same or in similar ways*".

The non-tangible elements of culture have to be interpreted along with the tangible ones when we relate them to sustainability. "Culture is the shared knowledge and schemes created by a group of people for perceiving, interpreting, expressing, and responding to the social realities around them" (Lederach, 1995). Historically, the era after the age of discovery witnessed the large-scale colonization of the world by the European powers. This resulted in the assimilation of different cultures, both tangible and nontangible, into the colonial realms. The trade, along with the missionary activities, brought diversification in faith, language, dress, and technology. The question of sustainability was addressed with technological innovations and research in agricultural sciences and animal husbandry. The problem of hunger and malnutrition became a worldwide phenomenon.

The United Nations started assessing the problem of hunger. The conservation of the environment and issues of development came to the fore. The General

Assembly of the United Nations, in order to set a global agenda, created the World Commission on Environment and Development under the Chairmanship of Gro Harlem Brundtland in 1982 to prepare a comprehensive report. The commission came out with a report entitled "Our Common Future" in 1987. This report introduced the concept of 'Sustainable Development'. The considerations which led to the recommendations of this commission were some of the environmental issues such as global warming, a threat to the ozone layer, desertification, and loss of agricultural land. There were tragedies such as the African famine, the Gas leak in Bhopal, the nuclear disaster at Chernobyl. The concept states that "Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs." Furthermore, it was stated that "Sustainable development is not a fixed state of harmony but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future and present needs."

The questions which arise in this context are: Is the world culturally homogenous and amorphous? Is the present generation aware of the culture of future generations? Is the food basket in the present time the same world over? Whether the energy needs will remain the same or alternative sources may emerge? These are some of the questions to be pondered upon while dealing with the question of sustainability.

The Experience of Sustainability and Cultural Pluralism in India:

India is a land of diversities that exist in her physical and natural realms; social structure; occupational patterns; and overall cultural realms. The process of living together produces and nurtures different discernible cultural traits through the interactive relationship of give and take. Indian Culture has long continuity of thousands of years along with diversity and heterogeneity. The cultural characteristics of India have been derived from her long sustaining history which has witnessed many ups and downs.

Indian society is multi-religious, multi-ethnic, multi-linguistic, and hence, multi-cultural. India received waves of migrants, over a long period, from West Asia, Central Asia, and the Tibeto- Mayanmar realms. The successive migrations brought Aryans, Mangoloids, Huns, Kushans, the Sakas, the Greeks, the Arabs, the Persians and the Turks. Some groups migrated from Gurjia and settled in the western part of India. Place names such as Gujrat and Gujaranwala in Pakistan and Gujarat (Gurjar Pradesh) in India indicate towards that process.

India also had an extended cultural realm, particularly beyond her three empires, i.e., Majapahits, Srivijaya, and Yavadweep. Her cultural realm was much larger and included east and central Asia. Susan Gole (1983) identified three realms by describing the country as:

"India Intra Gangum—India within the Ganges—was the Latin name used by Europeans for many centuries when they were referring to what we now call the Indian Subcontinent or South Asia. There were many **Indias** since the term was used for known or unknown land beyond the river Indus, and even for some areas on the African continent. Hence, our India was known as India 'on this side of Ganges' to distinguish it from India beyond the Ganges which meant mainland South-east Asia, 'India Superior' which might extend to northern China, or the more general term 'India Orientalis', which included all the islands from Australia, Japan, and beyond." (Gole, 1983).

This part was known to the world from earlier times and had attracted the attention of many travellers as well as traders. The richness of her resources was also well known which attracted migrants as well as invaders. The different waves of migrants brought people along with their cultural traits e.g., religion, philosophy, food, clothing, music, dance painting, sculpture, architecture, and above all languages.

Firaq Gorakhpuri, a renowned Urdu poet of India put the phenomena as under:

"*Sarzameene Hind per aqwame Aalam ke Firaq*
Kafile baste gaye ,Hindostann banta gaya".

It means that successive streams of migrations of the people from different nationalities of the world came and settled on the land of India and thus, the culturally diverse nation was formed. The facts reveal that out of the total population of India, about 1.3 billion i.e.,78.80% are Hindus, 14.23% Muslims, 2.30% Christians 1.72% Sikhs, 0.70% Budhists, 0.37% Jains and others (Census, 2011). Thus, the followers of all the major religions and faiths of the world have settled here. Population diversity in India is both spatial as well as hierarchic. The caste system emerging from *Varna vyawastha* is socially hierarchic with clear identities and social and ritual norms.

The whole population is divided into about 4,635 communities, some educationally and technologically very developed and some are still in primitive stages. India also has a linguistic mosaic. There are 22 languages in the eighth schedule and 99 languages are outside the schedule. Thus, there are 121 languages and 1,369 dialects (Census, 2011). The states of India were reorganized in 1956 on the basis of major languages spoken in the states as a result of the recommendations of the States Reorganization Commission. Now new states have been carved out within the same linguistic region due to regional identity politics.

India has been an agricultural country and depended on agricultural and allied activities for sustenance. In modern times Indian agriculture has transformed from primitive subsistence farming to highly developed plantation agriculture to specialized protected farming but simultaneously, the primitive forms such as shifting agriculture (Jhuming) to subsistence grain farming are also continuing side by side. The importance of agriculture and animal husbandry can be judged from the fact that they had found a place in Article 48 of the *Constitution of India* under Directive Principles of State Policy. It provides, "*The state shall endeavour to organise agriculture and animal husbandry on modern and scientific lines and shall, in particular, take steps for preserving and improving the breeds and prohibiting the slaughter of cows and calves and other milch and draught animals*."

Besides being a very important economic activity, agriculture and its allied activities have given rise to many cultural traits of the Indian population. The following proverb in Hindi emphasises this importance:

Uttam kheti madhyam baan,

Nikhidh chaakri bheekh nidaan

(The best profession is agriculture and the second best is trade; service is a very lowly profession and begging is undesirable.)

As a source of sustenance and livelihood, agriculture in India is as diverse as the terrain and landforms of the country. This occupation has transformed from subsistence to commercial cultivation. The importance of agriculture as sustaining occupation can be understood by the festivals related to harvesting. There are numerous such regional festivals celebrated during different seasons of harvesting the crops and the post-harvest period.

There are regional variations in these festivals though most of them are related to harvesting. These variations can be attributed to the size of the country, climatic conditions such as temperature and rainfall patterns, and seasonal variation in agricultural operations such as sowing, weeding, irrigation, time of maturity of crops, and then harvesting. These variations can clearly be perceived from Kashmir and Ladakh to Tamil Nadu and from Rajasthan to Arunachal Pradesh. Thus, the time of festivals also varies on the basis of these variations. For example, *Baisakhi* is celebrated in North India on the first day of *Baisakh* (April-May) just before the harvesting of rabi crops begins. *Lohri* is celebrated on the eve of Sankranti in January in Punjab and neighbouring states by creating a bonfire, in which sweets (rewadi), peanuts, puffed rice and sugarcane are offered. *Nuakhai* is celebrated in Odisha to welcome the harvest of new rice. Nabanna (*Nav+anna* -New grain) is the harvest festival of West Bengal in which the newly matured rice is harvested. *Bhogali Bihu* signifies the beginning of the agricultural season in Assam in April. Bihu is also an elegant dance form in Assam. Different tribal groups in Meghalaya celebrate the harvesting festivals with different names. The Khasi tribe celebrates *Ka Pomblang Nongkrem* as a thanksgiving festival in October -November and the Garo tribe celebrates the *Wangala* festival to mark the end of agricultural year. The *Apatani* tribes in the *Ziro* valley of Arunachal Pradesh celebrate the *Dree festival*, in which they worship the Gods for a successful harvest.

A number of colourful festivals are celebrated in South and the west Indian States. Pongal is celebrated in Tamil Nadu. Rice is boiled in milk and jaggery in a pot till it

spills over. It is also a post-harvest festival and coincides with the sun entering the Tropic of Capricorn. The sweet, thus prepared is given to cows and consumed by people. *Onam* is celebrated as a harvest festival in Kerala in the month of August-September with great fanfare. *Gudi Padwa* is an important festival in Maharashtra and Goa celebrated in the month of Chaitra month (March-April), It signifies the onset of the New year as well as the beginning of the harvesting of the rabi crops. There are many other festivals on the occasion of New Year as well as temple festivals. In India, every day has some festivity enriching her culture. The common thread in these festivals is to show reverence and gratitude to mother nature and thanksgiving for the success of their main activity of sustenance, i.e., agriculture and allied activities.

The forms of these festivities may be different, but the spirit which runs across them is the same. These activities highlight the relationship between the means of sustenance and cultural attainment in India.

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Sustainability, Mental Health, and Covid-19: An overview with reference to low- and middle-income countries (LMICs)

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1. Introduction

Mental health is recognised as a central pillar of health and wellness but remains neglected in the overall context of population health in low- and middle-income countries (LMICs). In the context of global mental health, even high-income countries (HICs) are remiss on their capabilities to deliver world-class mental health care when policies and recommendations abound. Arguably, with a global health perspective driving policies for improved mental health and achievement of sustainable development targets, incisive health improvement focused decision-making and quality preventive interventions would be expected from health services in usual and times of crises. When COVID-19 pandemic was declared (United Nations, 2019; World Health Organisation, 2020a), it emerged as a threat not just to lives but also to the very social and economic fabrics of countries, the global responses were registered around prevention in transmission but management of the critically ill and dying, and coping with bereavement in unprecedented societal experiences fear and isolation. COVID-19 exposed gaps in healthcare services and the relative absence of mental healthcare provision in LMICs. The rapidly changing local and global health environment placed strains on the healthcare systems of high-income countries (HICs) as well as LMICs. In this paper, an overview of the association between sustainable development goals (SDGs) and mental health, and the impact of COVID-19 on the SDGs in low- and middle-income countries (LMICs) were explored with reference to population health and mental health services.

2. Diseases prevalence in Low- and Middle- Income Countries

Low- and middle-income countries make up 80% of the world population. Low- and middle-income countries fare badly on most indicators, be it health, economic, social orclimatic, due to natural disasters, conflicts and displacement. LMICs are very diverse in their demographics, economies and infrastructures, cultural orientation, vulnerability to climate change, and health systems resilience. LMICs remain vulnerable (Quinlan, 2021) and have relied on HICs for most part of their economies, health and education and training for health services. Historically, LMICs have suffered from higher prevalence of communicable infectious diseases, resulting mortality and disabilities. In times of health emergencies, when uncertainty about outcomes is high, not only the physical health of the population is at risk and of concern but mental health too, with resulting psychological reactions, anxiety and depression rates being among the most prominent.

Following the impact of COVID-19 on the economies of countries, the World Bank and other institutions including the Organisation of Economic Co-Operation and Development (OECD) re-categorised some LMICs based on their performance against indicators such as social, economic, environmental and institutions. A return to poverty was being predicted for some LMICs as a direct consequence of the pandemic on global economy (International Monetary Fund, 2021; World Bank, 2022). LMICs in all regions of the world have historical burden of diseases to confront, be it communicable diseases of epidemic proportion, and in recent decades, non-communicable diseases which are preventable but nonetheless escalating to increasingly higher prevalence (WHO, 2021a ; Islam et al., 2014). Whilst the projection of the increase in the burden of noncommunicable diseases, and the call to action to build on the services to manage these diseases through primary healthcare services (Haque et al., 2020), there seems to be little change in the discourse about communicable diseases with the highest mortality and morbidity, and notable variations in prevalence of multimorbidity (Asogwa et al., 2022). The burden of diseases in LMICs has commonly been communicable diseases, with infectious diseases such as malaria, tuberculosis, HIV/Aids presenting with high prevalence in different global regions. Paradoxically, infectious diseases also carry risks for causation of non-communicable diseases

and reduce the quality of life in LMICs population. Infectious diseases have an impact on patients' continuing health and eventually increase the burden of non-communicable diseases (Coates et al., 2020). Infectious pathogens such as hepatitis B virus, helicobacter pylori and hepatitis C virus carry risks that can have a profound effect on the disability-adjusted life years (DALYS). Whilst the impact of communicable diseases on population health cannot be underestimated, it is worth noting that in LMICs in different parts of the world, the dichotomy between communicable and non-communicable diseases can be problematic in that it does not represent uniformity in prevalence and incidence of specific diseases (Oni & Unwin, 2015). Therefore, it is important to differentiate among LMICs and the burden of diseases respective to their health profiles and using another approach in identifying distribution of diseases using the 'acute vs chronic' classification. In the context of the COVID-19 pandemic, these differentiations may not be imperative but certainly informative in devising health and social care policies and determining priorities in calmer times.

3. Healthcare systems in low- middle-income countries

Healthcare systems in LMICs have been improving and evidence points to improvement in maternal and childcare, and also in infectious diseases, yet the poorest people received poor quality care. Health care expenditure mitigates against rates of mortality (Owusu, Sarkodie & Pedersen, 2021). High quality care can prevent and reduce deaths. A recent review suggested that death rates in LMICs could be prevented with development of health systems to provide high quality care and better utilisation of healthcare services on the part of people (Kruk et al., 2018). In developing countries, not unlike the situation in high income countries, mental health has not had equal consideration as physical health and in terms of investment, expenditure has been constantly left behind. Poor mental health literacy (Ganasen et al., 2008), workforce and health professional preparation are issues of immense concern given continued uncertainties about the long-term impact of COVID-19 and further impact of new waves due to variants of the virus.

The healthcare systems in LMICs were already fragile in countries where resources are scarce, and not readily available to manage the pandemic effectively and

efficiently. In these resource-limited countries there were obvious constraints in primary care provision, hospital beds, facilities for emergency and critical care with equipment such as respirators, personal protective equipment, pharmaceutical products and skilled healthcare personnel to mitigate the impact of the pandemic on the population. The strain on healthcare systems were obvious, the risks of healthcare systems collapse recognised, and desperate actions taken to avert such situation. The pre-existing shortage in health care workers and any subsequent depletion in the workforces would threaten the stability of health care systems that were already vulnerable. The mental health of health care workers also came into sharp focus, with mental health conditions being reported by health care workers and highlighting the need to develop informed mental health interventions (Moitra et al, 2021). Mental health services are equally susceptible to factors that are not directly related to workforce issues. In LMICs, the examples here would be economic and social policies to mitigate the effects of loss of earnings, and availability and access to pharmaceutical products, laboratory services, diagnostic equipment and technological devices. In the early days of the pandemic leading to enforced confinement/quarantine, the impact of economic and social measures compounded responses through the lack of resources and quality personal protective equipment in the emergency care facilities and primary care alike.

4. Sustainability Development Goals and LMICs

Launched in September 2015 at the General Assembly of the United Nations, the sustainable development goals (SDGs) consist of 17 goals, 169 targets and 232 indicators. Mental health was stated as a development priority. The SDG target 3.4 stated that, by 2030 premature mortality from noncommunicable diseases should be reduced by a third through prevention and treatment and promotion of mental health and well-being (United Nations, 2015).

The sustainable development goals (SDGs) were welcomed among claims that these will bring about more enhanced, cohesive and inclusion in processes that engaged the scientific communities across the various disciplines and heralded a new era of global cooperation and solidarity (Thornicroft and Patel, 2014).

Solutions to the health problems of LMICs are compounded by dependency on international organisation. Systemic health crises in LMICs account for mortality and continued health problems in the course of diseases.

Buse and Hawkes (2015) have argued that there needs to be a shift in the thinking about implementation of the SDGs, pointing to five areas where transformative actions should be considered. One of these was to consider a shift in focus from treatment interventions to prevention. They argued that for this shift to be achieved there should be approaches that are locally led and astute in politically smart policies. This could not be more relevant in the case of mental health, where there has been a paucity of well-thought out, planned and assisted programmes of prevention and recovery. Reflecting on the diverse, demographic, geographical and environment, social and economic status, health systems and political governance of LMICs, the challenge set here is enormous. In the wake of the impact of the pandemic, this challenge has got even more poignant.

Even before the COVID-19 pandemic, it was evident that there were disparities across LMICs in their commitment and delivery on the MDGs (Druetz, 2018), and it has also become clear that better quality of care has not been a universal experience in LMICs health systems with only a small proportion of service users expressing satisfaction and patient safety outcomes posing concerns (Kruk et al., 2018). Although significant to health, the MDGs had not included mental health (Thronicroft & Votruba, 2015; United Nations, 2000). Following much lobbying and academic work to make good, the UN SDGs framework consisting of 17 goals and setting 169 targets for 2030 were agreed upon (United Nations, 2015). As stated earlier, the significance of the health target 3.4 which included mental health was immense. Any reduction in premature mortality from noncommunicable diseases through a combination prevention and treatment measures complemented by promotion of mental health and well-being would be most desired. Thus, mental health has been recognised as an integral part of the SGDs (Dybdahl and Lien, 2017). The SDGs superseded the Millennium Development Goals (MDGs) and extended the scope of what constitutes a more inclusive, detailed, issue-specific approach and declared health a central pillar in international development. Global mental health experts have deliberated on the potential gains for LMICs in the development of mental health services context of global health (Patel

et al., 2018). The Lancet Commission on global mental health and sustainable development has championed mental health and offered perspectives on how SDGs can enable assessment, and advancement and progression of agenda for change and improvement (Patel et al., 2018). However, critics have pointed out to the failure of MDGs to achieve substantial improvement (Jacob, 2011) and that there were already missed opportunities in examining and advocating for the implementation of mental health services reforms (Jenkins, 2019). A comprehensive approach will go a long way in providing much needed support to health systems in LMICs to scale up education of their health professionals, rethink and strengthened their health systems and sensitise their population to compassionate and anti-discriminatory behaviours towards mental illness.

COVID-19 posed intense challenges in addressing existing mental health prevalence and uncertain incidence. Mental health and comorbidities made people with learning disabilities highly vulnerable (Courtnay & Cooper, 2021). Thus, the drive towards equity and inclusion in mental health, should take account of people with learning disabilities as well when considering the impact on the health of LMICs. The relationship between mental health and the need to have realistic and robust policies and supporting funding for sustainability is unquestionable. The interrelationship between mental health and sustainable development across the lifespan of a population is undeniable, and inextricable from the key set of goals to achieve social, economic and health equity goals.

The health care systems in LMICs were at different levels of preparedness for disaster management. The SGDs have been put at risk by COVID-19. In LMICs the already weak healthcare systems need to be strengthened to effectively address the continued impact of COVID-19 first wave and currently second wave. Progress in implementing some of the SDGs has already been held back (Fenner & Cernev, 2021), due to decades of economic plight with years of austerity and global climate changes, natural disasters, civil unrest and wars, with LMICs being the most affected. In some cases, a fault of geography as one might put it. The reconfiguration of governments' policies had hardly begun to have an informed evidence-based input in SDGs, when the COVID-19 pandemic has reshaped the economic and health landscapes. Would these SDGs ever be realised, the goals and targets for health achieved, and in particular mental health? Time will tell. In

terms of the resilience of countries to address their health and wellbeing agenda, mental health ought to be at the core of policies to achieve the 2030 goals.

5. Lenses on mental health

Mental health gets insufficient attention, often relegated to the lower priorities in health policies and investment. Mental health is ever more significant. In an editorial in The Lancet (2020, p.1045), the emphasis was placed on mental health, stating '*Without a focus on mental health, any response to COVID-19 will be deficient, reducing individual and social resilience, and impeding social, economic, and cultural recovery*.' The need to invest in quality mental health services has been amplified and driven home by the COVID-19 pandemic. The place of mental health cannot be underestimated in the efforts to achieve the sustainable development goals. Mental health should now more than ever get the attention it should from policymakers, healthcare professionals and non-governmental organisations in LMICs. The tendency has always been for LMICs to follow what the World Health Organization and United Nation institutions recommend, and that too not with any consistency to implementation and evaluation of programmes. Where differences have been seen are when international collaboration and capacity building in clinical education and practice and research are implemented. In LMICs, lack of systems approach to healthcare services and unavailability of mental health services that continue to be goals that were note delivered to the level the Millennium Development Goals (MDGs) had promised despite pledges from world leaders to respond to healthcare needs of their people (Sankoh, Sevalie & Weston, 2018). Going forward, lessons from the past decade and most significantly during the times of COVID-19 should encourage the development and delivery of innovative systems of mental health care and capacity building in professional mental health workforce in the hope that this would shape the future of mental health care experiences of people in LMICs (Votruba, Thornicroft and the FundaMentalSDg Steering Group, 2016; Thornicroft et al., 2016).

Mental health care services are far less accessible in LMICs than in HICs (Moitra et al., 2021) and unevenly distributed across the world and within regional, urban and rural areas within countries. Long before COVID-19, mental health has been

deemed as not meeting the demands for healthcare. With the COVID-19 pandemic, healthcare services were overwhelmed, affecting frontline healthcare workers. The impact was manifest in reported prevalence of symptoms of depression and anxiety, psychological trauma, causing stress, burnout, fatigue and distress among health professionals.

6. COVID-19 and mental health in LMICs

In the early days of the pandemic, the World Health Organisation's (WHO, 2020b) rapid assessment survey reported extensive disruption to critical mental health services in 93% countries worldwide, with demands on mental health provision increasing during the same time. To note, among other salient findings, highlighted were the disruption to counselling and psychotherapy (67%), harm reduction services (65%), and medication (30%). Countries needed to adapt rapidly. The World Health Organisation's scientific brief (WHO, 2022), report on the global scenario after the first year of the pandemic, stated a 25% increase in the prevalence of anxiety and depression worldwide and called on countries to increase the psychological support for their population. It was noteworthy that although countries had included mental health and psychological support in their plan to respond to the impact of COVID-19 on mental health, the report highlighted that gaps remained. It alerted the need for further research on mental health and COVID-19 among at-risk groups, particularly in LMICs.

Reviews of the impact of COVID-19 on mental health (Chakraborty 2020), mental healthcare services (Byrne, Barber & Lim, 2021) suggest that mental health care provision has been of concern in most LMICs because of lack of investment and limited health care personnel in mental health to the size of the population. Differentiation between health care professional grades for the different sections of the population, e.g. children and adolescents, adult men and women, older adults, or by mental illness clusters and specialist practice, it is unclear what the rue impact were as data is sparse. The risks were however to everyone, across clearly identifiable sections of the population (Javed, Sarwer, Soto & Mashwani, 2020). Moreover, the context has been shifting during the pandemic which has

aggravated poverty levels and severe disruption of critical mental health services (Kumar & Kumar, 2020).

The mental health of people in LMICs was impacted severely during the first and second waves of COVID-19. The pandemic has exacerbated mental health needs in already under-resourced health systems. Shortfalls in preparedness to manage the pandemic across all levels of income countries were exposed and even the most advanced healthcare systems were challenged, their capacity and ability to deal effectively with the pandemic in preventing spread and recording high mortality in the first half of 2020. Community health workers as well as hospital-based health professionals were themselves exposed to the effects of COVID-19 and concerns about their health and well-being were witnessed daily as frontline workers were becoming infected and mortality became a stark reality in thousands of cases (WHO, 2021b). In Trinidad and Tobago, prevalence of depression (42.28%), anxiety 56.2%) and stress (17.97%) among health workers were reported (Nayak et al., 2021). In Pakistan, Salman et al (2022) did not find significant differences between doctors, nurses and pharmacists, but reported the overall prevalence for anxiety as 21.4% and depression at 21.9%. Protecting health care workers was a key imperative in the fight against COVID-19. It would be unimaginable to contemplate patient safety without health care worker safety, including mental health safety, when demands on them are at high intensity. The WHO scientific brief (WHO, 2022) indicated exhaustion among healthcare workers to be high with loneliness and a positive COVID-19 diagnosis posing increased risk of suicidal ideations. As elsewhere, in LMICs with similar health systems structure, health care workers in Africa were exposed to Covid-19 with less resources for personal protection and exposure and having to cope with unprecedented risks to their own health.

The prevalence of depression, anxiety and stress as major mental illnesses were being reported from the early days of the pandemic. Lakhan, Agrawal and Sharma (2020) in a review of 16 studies reported rates of prevalence of depression (20%), anxiety (35%) and stress (53%) respectively, adding that the prevalence rates of sleep problems and psychological distress were also higher during COVID-19. The updated prevalence remains relatively high and worrying, reportedly a 25% increase in prevalence rate of depression and anxiety globally (WHO, 2022).

7. Psychological interventions in the context of LMICs

Further insights could be gained by looking at reports from LMICs in different geographical regions. In India, Anand et al (2021), confirmed the prevalence of psychological distress (53.86%) and also reported that participants were more likely to be distressed due to lack of trust in the government and if they were not satisfied in fulfilling their unsatisfactory basic needs.

In the Philippines, moderate to severe psychological impact were reported (Tee et al., 2020). In this study, the psychological impact of the outbreak as moderate-to-severe were reported by 16.3% of respondents with another 16.9% reporting moderate-to-severe depressive symptoms. Furthermore, 28.8% reported moderate-to-severe anxiety levels and 13.4% stated experiencing moderate-to-severe stress levels. Experiences of discrimination and higher levels of anxiety, depression and stress were shown to be significantly correlated.

In Indonesia, a third (34%) of respondents reported having mild to moderate levels of distress, and about 2.8% severe distress. In the early months of the pandemic, about 40% reported moderate to severe distress (Respati et al., 2021). In Thailand, the level of psychological distress experienced was mostly by those aged 60 years and above, and factors contributing were loss of employment and debt incursion (Pothisiri & Viscerra, 2021). Living in rural areas was observed as a protective factor.

Mental health needs in LMICs were extensive, and some aspects were not given equal attention. For example, self-harm and suicide among migrant workers (Knipe et al., 2022). This leaves a large area of mental health unexplored. Responses to the impact of COVID-19 pandemic on mental health needs in LMICs were varied in the early days of the outbreak, when hospitalisation and mortality rates were on the rise, and emotional reactions negative.

In comparison to HICs, LMICs are resources strapped in all aspects of service delivery, starting with the health systems, health professional numbers and capacity to respond to the pandemic which was showing no sign of attenuation. Rapid education and training of healthcare professionals was required to confront

the many challenges presented by the pandemic. These included mental health of the healthcare workers who were affected by anxiety, depression, stress and burnout, as well as physical health and compassion fatigue.

Response to mental health needs of people during the pandemic was either not formalised or was lacking in health policies. Across LMICs the response to COVID-19 in the early part of the pandemic when cases were at their peak, showed a lack of preparedness, with no formal mental health plan in place. For instance, in a review of response to the COVID-19 pandemic, Jaguga & Kwobah (2020) reported that in Kenya there was no formal plan, and even with preparation of guidelines, implementation challenges remained. To counter the impact of the pandemic they advanced strategies to training health workers to deliver psychological support and use of mobile technologies for accessibility. In a review that included the delivery of psychological support in 10 countries in Sub-Saharan region of Africa, Molebatsi, Musindo, Ntlantsana and Wambua (2021) examined the mental health needs guidelines informing practice and found that there were gaps in the guidelines that made them less effective in meeting the health needs of the communities. The provision of psychological interventions during COVID-19 presented challenges beyond what were confronted in pre-COVID-19 times. The Americas reported lack of planned action, policies and implementation of measures to support psychological wellbeing and health. In an extensive review, that included a large cross section of the population who were by definition not in the mainstream, Pedrosa et al (2020) highlighted the utilisation and great value of psychological support provided through telecommunication and use of hotlines as sources of information and contact for vulnerable people. People with existing mental health illnesses were not receiving interventions face-to-face, online interventions were limited, placing them at a disadvantage and at risk of further deterioration in health and poor outcomes. However, the concerted responses from LMICs have been remarkable, with early implementation of measures, for example, quarantine, the social distancing, wearing of masks and providing economic support. Mental health interventions took innovative forms and e-mental health interventions and use of social media as platforms for engaging in psychological therapies.

Improvisation and the use of technologies were implemented in the delivery of psychological support and intervention. For example, the use of e-mental health care in the Asia Pacific region (Murphy et al., 2021). Though e-mental health care was found to be a viable alternative of delivering psychological support, two issues that of accessibility and acceptability were pointed out as needing consideration when planning such interventions. Similarly, Fu, Burger, Arjadi and Bockting (2020) reported on the effectiveness of digital psychological interventions which were found to be moderately effective. At this time, in reaching out to people where usual psychological care in restricted or not available, interventions delivered with distance digital technology and social media have been shown to be useful option. Ortega et al., (2021) reported successful strategies in overcoming barriers in reaching out to rural communities in Mexico. The strategies adopted an integrated approach to addressing psychological support and co-working, task-sharing and capacity building. Included in the strategies was psychological support to the general population. The outcomes showed engagement in community-based initiatives with planned focus and empowering of the communities.

Community-based interventions have shown acceptability and enhanced engagement on the part of participants. An example of such a community-based intervention was a 12-week programme aimed at preventing loneliness, boredom and providing education about COVID-19 to older people in restricted living settings (Jarvis et al., 2022). The findings of the qualitative study highlighted the need to build trust and confidence in the participants for them to participate and accept the programme and benefit from it to maintain their wellbeing.

A recurring theme of great significance in dealing with mental health has been stigma and discrimination. With COVID-19, the emergent concerns about discrimination and stigma as a barrier to tackling the social and health consequences of COVID-19 should be no surprise to health professionals, particularly those delivering mental health services. In a qualitative study of the COVID-19 related discrimination and stigma against healthcare workers, patients recovering from COVID-19 and those suspected of COVID-19 in Ghana, Adom, Mensah and Osei (2021) found that various forms of stigma were reported, including stereotyping, finger-pointing, insults, mockery and social exclusion. In their commentary, Javed, Sarwer, Soto & Mashwani (2020) pointed to the effects

of stigmatisation and Tehrani (2020) has drawn attention to vulnerable older adults and the impact on their behaviour and self-esteem. Stigma is a complex phenomenon, and intervention strategies to reduce the effects of stigma on an already vulnerable population requires much more research evidence to implement psychosocial support care. In reducing stigma and discrimination through active measures to implement health educational and advocacy programmes, the effects on people with COVID-19 and their mental well-being can be improved as well as in the general population. In a review, Thornicroft et al (2016) focused on interventions to reduce stigma. Among their findings that research from low- middle income countries were limited, and few studies focused on the service user's perspective and behavioural changes. However, social contact was an effective intervention in improving attitudes and knowledge but with shot-term gains. Therefore, social attitudes, knowledge about COVID-19, cultural values and beliefs about mental illness, and behavioural changes as key to reducing stigma and discrimination should be central to planning policies and actions.

8. Sustainability Development Goals and Mental Health post-Covid-19

The drive to ensure the inclusion of health in the sustainable goals, the huge effort and passion shown by leading institutions and experts, tracking the progress in adopting health related goals in the previous MDGs, the movement to get the SDGs to include mental health, witness decades of dedication and indefatigable work by many, in many regions worldwide. The trajectory from MDGs to SDGs and the visibility of mental health can be tracked (Mills, 2018; Izutsu et al., 2015; Patel et al., 2018).

COVID-19 has certainly put SDGs at the centre of health targets and associated targets and goals. The effects of COVID-19 have been explored and analysed form varied perspectives. Shulla et al., 2021; Wang and Huang (2021). COVID-19 will affect all the SDGs and the agreed goals. Wang and Huang (2021) have posted negative impact of COVID-19 on mental health medication supply and overwhelming the health system. Dependent upon the actions of governments, LMICs will be affected

differently but the emphasis on solidarity and international development may mitigate some of the effects at country level. With reference to health and mental health, Wang and Huang (2021) have made suggestions for social sustainable goals development which might include health as targets because of the synergy and interactions between SDGs, as mapped out by Pradhan et al. (2017). The realisation of interdependence between the 17 SDGs and their goals would support arguments that though the negative impact on the SDGS, could have a detrimental effect on health and economies, driving poverty up and economic growth down, increase inequalities (Shulla et al., 2021). Growing inequalities will put further at risk the health and wellbeing people in LMICs, with mental health priorities undermined with resources reallocated to other priority sectors. On a more positive outlook for SDGs, referring to No poverty, No hunger, and Good health and well-being, Fenner and Cernev (2021) suggest from their assessment of possible scenarios, that institutions like the World Health Organisation and United Nations will be strengthened and that 'As economic stability returns in the longer term, recently imposed temporary caps and reduction on aid spending are removed with additional resources provided to poorer countries to meet their SDG targets' (p.7).

Interestingly, partnerships are being forged in the drive to ensure that preventive health outcomes can be in future. The Lancet Nigeria Commission is such an initiative which holds the promise to translate the vision into reality for the people of Nigeria (Abubakar et al., 2022). The intentions are all encompassing, yet so much depends on the domestic politics, economics and health systems and the health professionals and academics. A global approach in addressing one nation's health yet no mention of mental health. Research in mental health and related health systems, implementation of evidence-based practice, as an area for collaboration and capacity building that have been recommended in the past editorials and current commentaries (Thornicroft, 2012; Addo-Atuah et al., 2020; Sisa, Fornasini & Teran, 2021). The recurrent theme that is perhaps the most important is the funding of upscaling mental health systems in LMICs. COVID-19 has laid bare the gaps that exist among countries, more so the relative divide between HICs and LMICs.

9. Future directions and transformative approaches

In April 2020, there were demonstrations about the need for collaboration in the international community in the form of a coalition in facilitating research in the production of vaccines through clinical research (White, 2020). This kind of collaboration and cooperation are nevertheless reliant upon funding. The place of mental health in the grand scheme of health for all post-COVID-19, and investment in mental health systems and workforce will be challenges hotly tracked by stakeholders, academics and people who the SDGs are meant to protect and nurture. The chronic shortage of resources as reported in the WHO 2020 Mental Health Atlas, governments worldwide were spending just over 2% of their health budgets on mental health. Many low-income countries were reporting having in their health workforce less than one mental health worker per 100,000 persons. It will take time and much prime-pumped funding to ensure higher quality through education and training of the workforce. What the COVID-19 pandemic has shown clearly is that LMICS are vulnerable due to their geographical location, environmental and climatic changes, and the arrival of the pandemic just added to diseases burden on economies and healthcare systems that were already at full stretch and some at breaking point (Unstats.org, 2018).

One of the lessons learned during the pandemic was that learning from the experiences of other countries in a critical health crisis. Although not immediately conceded, learning between HICs and LMICs is collaborative, as illustrated by an example from integrated care (Mounier-Jack, Mayhew & Mays, 2017), advocating a much more holistic approach to health care organisation and provision. In the case of the COVID-19 pandemic it very quickly became clear that access to vaccines and sharing of expertise was imperative because '*we were all in in together*', transmission of the virus did not discriminate between HICs and LMICs. Health policy analysis focused how countries responded to COVID-19 can shed light on the what and how needs to be done to scale up mental health and psychological support services, particularly among at-risk and marginalised people (Tausch et al., 2022). In terms of the model of care, a major aspect of the management of care during the pandemic focused on the physical more that the psychosocial. Acknowledging the importance of psychosocial model would enhance the discourse and impact on the ground. The focus on healthcare

providers in the community-based mental health services should not be allowed to fade as COVID-19 pandemic has reinforced its pivotal place in the health systems in LMICs. In preparing a workforce ready to respond to similar health crises, investing in the education and training of health care professionals in therapeutic interventions at all levels is key to an assured policy for mental health in LMICs.

Investing in community health workers could ease the burden of care faced by other healthcare settings, primarily in hospitals. Sustainability requires investment in the healthcare systems. For far too long the debates have been had with persuasive academic arguments mounted and recommendations for various initiatives are being championed. However, these have not been matched by resourcing and substantial, equitable implementation. Sustainability in mental health cannot be pursued in half measures. In the pursuit of equity and fairness in the delivery of quality health care for people with mental illness and in the prevention of mental illness across the lifespan, requires policies informed by the data. However, the data itself needs to be of such quality and completeness that allows for analytical robustness and of value to determining policies and targeted investment, and if we are not to leave anyone behind (Buzeti, Lima, Yang & Brown, 2020).

The exhaustive and exemplary working among healthcare professional as witnessed during the pandemic ought to serve as foundations for further collaboration and capacity building frameworks appropriate for health systems in LMICs. Among the many academic disciplines that inform the SDGs policies for implementation, the role of the different branches of psychology, examples being environmental, clinical, behavioural and social psychologies, have massive contributions to make in areas of education and training as well as therapeutics.

10. Conclusion

Mental health remains an area of healthcare in need of investment, not just financial but in the development of skilled workforce to dispense interventions that are effective and make an impact on the quality of life, for those living with

mental illness and in the prevention of exacerbation of mental health problems. COVID-19 has had devastating effects on patients, their families and communities. LMICs need to better understand the causes and consequences of pandemics and be better equipped and prepared to face health-related challenges in the context of their economic, and social sustainable development goals. As to the SDGs, it will remain to be seen whether the 2030 targets will be achieved and in the field of healthcare, what impact mental health of people. However, it was encouraging to see how countries, LMICs and HICs collaborated in solidarity to confront the serious global health risks COVID-19 presented. To what extent the ground has been laid for the realisation of mental health services development, the health systems integrating primary health care and hospital-based care will be interesting to follow during this decade to see how the SDGs are delivering on the promise generated and championed. Across the SDGs there is a fundamental need to recognise the fact that psychology has much to offer in informing policies, development of education and training, and shaping effective interventions that are culturally congruent to mental health care needs of people in LMICs.

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Legality, Legitimacy, and Sustainability:

Realizing their inherent integrity in the backdrop of Covid-19 pandemic lessons

A Juridical Critique

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Abstract

The inherent integrity of legality, legitimacy, and sustainability, in a way, sums up the legal philosophy of environmental protection and sustainable development. Currently, the COVID-19 catastrophe, whether it's a man-made monster or a natural phenomenon, we are not sure, but surely it has affected the whole world just in one go and is still showing no signs of its total retrieval or abatement. Surprisingly, however, by the measure of the same philosophy of trinity, in our view, it holds a simple but powerful lesson that could help us in mitigating the onslaughts of environmental degradation: it provides a course-correction, directing us to move away from the modern culture of consumerism towards the ancient culture of 'dharma', which is a meaningful manifestation of the 'way of life', the life of simplicity, austerity, and *atamanirbhar*ta, prompting us to exploit the natural resources in a manner that would permit their enjoyment not only by the present but by the successive generations to come. This indeed is the foundational value reflected in the fundamental duty of every citizen under Article 51A(g) and the mandatory responsibility of the State under Article 48A, reinforced by the fundamental right of every person to life and personal liberty under Article 21 of our Constitution. If the course-correction desideratum is still not heard and heeded to, we shall be acting 'at our own peril'!

Legality, legitimacy, and sustainability are three conceptual terms that often come into play in any critical discourse on environmental protection in the pursuit of sustainable development. How to avoid environmental degradation in the course of the developmental process is perhaps one of the most acute problems that humankind is facing in the 21st century. The present critique is attempted in the light of recent judicial precedents,[1] showing how the process of

1 This critique is undertaken in the light of the two recent three-Judge bench judgments of the Supreme Court in *Tata Housing Development Company Ltd.* v. Aalok Jagga and Ors., (Decided On: 5.11.2019), MANU/SC/1508/2019 per Arun Mishra, J. (for himself and M.R. Shah and B.R. Gavai, JJ.) [Hereinafter simply *Tata Housing Development Company Ltd*], and *Hospitality Association of Mudumalai* v. In Defence of Environment and Animals and Ors., (decided on: 14.10.2020), MANU/SC/0762/2020: (2020)10 SCC 589: 2021 (1) SCJ 252, per *S. Abdul Nazeer, J. (for himself and S.A. Bobde, C.J.I., and Sanjiv Khanna, J.) [Hereinafter simply Hospitality Association of Mudumalai*].

development consistently with environmental protection could be resurrected and strengthened.

The concept of 'sustainable development' is conceived and directed to achieve the singular objective of progressive development, but by making it continually and consciously in consonance with the protection of our environment.[2] The trio of Legality, legitimacy, and sustainability, an indispensable ally of 'sustainable development', bears three distinct and yet closely related concepts to each other and also to one another. To begin with, during the evolutionary process, whatever was considered legal (that is, lawful) was also taken as legitimate (that is, just) in the moral perception of the people. Stating it conversely, whatever was perceived as 'just' came to be considered as 'legal' as well, thereby implying norms that were at once authoritative and binding.

In the complex of three concepts, the notion of sustainability (that is the survival and sustenance of humans in harmony with their surroundings) is central, inasmuch as the prime purpose of legality and legitimacy is to reinforce it (sustainability). In other words, for sheer sustainability, there has to be integrity between sustainability, on the one hand, and legality and legitimacy, on the other. Seeking such integrity in the trinity is necessitated, for it must have been realized merely through experience that we, in the social universe, eventually cannot survive and subsist without being in consonance with the echo system, where all the living organisms interact with each other and the surrounding environment. This implies that, in the scheme of nature, our very survival is distinctly marked by the law of interdependence. And this is what we have gradually learnt and continue to learn that humans, as well as wildlife, are completely dependent upon the environment for their survival.[3]

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2 For the evolution and development of the concept of 'sustainable development, see, infra, notes 17, 18, and 19, and the accompanying text.

3 See, *Tata Housing Development Company Ltd*, para 26: "The relationship between the human and animal can be understood by the food-chain and food-web. The wildlife is affected by several reasons such as population, deforestation, urbanization, high number of industries, chemical effluents, unplanned land-use policies, and reckless use of natural resources etc." For the fact matrix of this case, see, infra, notes 46 and 47 conjointly with their textual narratives.

Surprisingly, during the period when society and its social order developed through the mode of customary norms, a kind of congruency invariably always existed among the three concepts. Such norms, which laid down the standard of behaviour for regulating the conduct and activities of every person, both as an individual and as a member of society at large, were not consciously created but spontaneously evolved in consonance with our surrounding natural environment.

However, since the time societies became 'progressive' in the wake of the industrial revolution, we have gradually moved from 'spontaneous' to 'conscious' law- making. Sir Henry Sumner Maine, in his *Ancient Law* (1861), on the basis of his comparative study, predicated this transition through his seminal statement: "the movement of progressive societies has hitherto been a movement from Status to Contract."[4] The transition from 'Status to Contract' was accentuated by the shift to conscious law-making via codification. [5] Even so, in this process of transition/ shifting, a duality developed between legality and legitimacy. That is, whatever was legal might not necessarily be legitimate, and vice versa. With codification that turned the unwritten customary norms into writing, those norms with the passage of time, became relatively rigid and fixed and thereby ceased to grow with the growing needs of the changing society. Such norms, in order to seek compliance, need conscious tempering. We have seen such a phenomenon in the realm of Hindu Law, in which laws relating to marriage, succession, adoptions and maintenance, and minority and guardianship have been 'amended and codified', [6] but only partly. [7]

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4 This statement was made by Maine on the basis his comparative study of ancient societies belonging to Hindu, Roman, Anglo-Saxon, Hebrew and Germanic communities, envisioning that the whole development of law and other social institutions has been more or less on an identical pattern.

5 Ibid.

6 See the Preamble of each one of the Acts – Hindu Marriage Act, 1955, Hindu Succession Act, 1956, Hindu Adoptions and Maintenance Act, 1956, and Hindu Minority and Guardianship Act, 1956 - opens with the common statement: "An Act to amend and codify the law relating to [marriage, succession, etc.] among Hindus."

7 See the overriding effect of the codified law relating to marriage, succession, etc. as provided under Section 4 of the respective Acts. For instance, Section 4 in The Hindu Marriage Act, 1955, provides: "Save as otherwise expressly provided in this Act, (a) any text rule or interpretation of Hindu law or any custom or usage as part of that law in force immediately before the commencement of this Act shall cease to have effect with respect to any matter for which provision is made in this Act; (b) any other law in force immediately before the commencement of this Act shall cease to have effect in so far as it is inconsistent with any of the provisions contained in this Act."

Perhaps the most telling story of integrity amongst the 'trinity' of legality, legitimacy, and sustainability is found in the Indian traditional regime before the advent of Colonial Rule in India. The lives of the people and the society at large were marked by the value-based customary norms, handed over informally by word of mouth from one generation to another. Such norms were not consciously created. In the sense of history, they could, however, be traced to Vedic literature; that is, *Shrutis* (what was heard), which are in the form of four Vedas (in hymns or verses)- the *Rigveda*, the *Yajurveda*, the *Samaveda*, and the *Atharvaveda*- transmitted verbally across generations since time immemorial. The Vedas, along with Smritis (what was remembered), together called *Dharmashashtras*, are considered the inexhaustible source of the core values of human existence.

The values flowing from *Dharmashashtras*, constituting the basis of norms for regulating human conduct, came to be crystalized in what is compendiously called Hindu Law, which has "the oldest pedigree of any known system of jurisprudence," as wrote John D. Mayne in the "Preface" to his classic work, *Treatise on Hindu Law and Usage* (1878).[8]

The singular feature of those value principles is that they are not static but dynamic. Such dynamism is reflected in the commentaries and digests. To wit, Mitakashara and Dayabhaga are the two well-known commentaries on the value principles enshrined in *Dharmashashtras*. And how those principles are continually moulded and adapted through customs and usages is borne out by the classical statement of the Judicial Committee of the Privy Council that under the Hindu system of law, 'clear proof of usage will outweigh the written text of the law.' [9] The noticeable aspect with respect to legality, legitimacy, and sustainability all along was that there existed a reasonably functional unity amongst those three concepts in meeting the diverse needs of changing society.

In the transition from spontaneously evolving normative rules regulating human behaviour *to* conscious law-making to maintain the much-needed integrity amongst Legality, Legitimacy, and Sustainability, we gradually developed the

8 See author's article, "Hindu Law: Overview," in *The Oxford International Encyclopaedia of Legal History* (Oxford University Press, USA, 2009)

9 See, Collector of Madura vs. Moottoo Ramalinga Sethupathy, 12 M.I.A. 397 (1868)

concept of constitutionalism. This is a system of governance in which sovereignty lies neither in the Parliament, nor in the Executive, nor even in the Supreme Court. It lies in the Constitution itself, for it is considered to be the repository of all fundamental values that are required for regulating the polity of a nation. Such values include specifically how the State is mandated to lay down the norms that would at once be legal and legitimate and lead to sustainability.

To wit, Article 48A of the *Constitution of India* has been incorporated with a view to giving a clear policy mandate to the State that it is obligated 'to protect and improve the environment, and to safeguard the forests and wildlife of the country." Consistently with this State obligation, under Article 51A(g) of the Constitution, it is the duty of every citizen of India to protect and improve the natural environment including forests and wildlife, and to have compassion for living creatures. By virtue of their juxtaposition, State obligation under Article 48A, being a part of Directive Principles of State Policy in Part IV, and the responsibility of every citizen, being a part of Fundamental Duties in Part IVA of the Constitution, the provisions of both to preserve and protect the environment remained somewhat subdued. Since these provisions are non-enforceable, they could not be prompted as such into force through the instrumentalities of court.

However, sensitive to the need to protect the environment, the Supreme Court has shown great ingenuity. It read the provisions of both the Articles – Article 48A and Article 51A(g)- of the Constitution in conjunction with fundamental rights specified in Part III of the Constitution. Such a conjoint and cumulative reading instantly put the whole gamut of the law relating to environmental protection on a firmer footing. This is so at least in two principal respects. One, any violation of the law relating to environmental protection framed under the Constitution could be questioned as the infringement of fundamental rights, and, thus, become readily enforceable under Articles 226 before the High Court or Article 32 directly before the Supreme Court. Two, the foundational principles underlying those constitutional protective provisions have been made inviolable by all the principal organs of the State– the Parliament, the law-making instrumentality of the State; the Executive Government, the law enforcing agency of the State; and the Supreme Court, the apex adjudicating institution of the State, through

the contrivance of Basic Structure Doctrine.[10] Particularly reference may be made of such foundational principles as Doctrine of Trust,[11] Inter-generational equity, Precautionary principle, Polluter pays principle.[12]

How have the foundational principles of vigorously protecting the environment, as if 'with a vengeance', emerged through the medium of judicial intervention? This indeed is the story of impingement of Legality, Legitimacy, and Sustainability. For having an insight into the interplay of these three concepts, we need to have a glimpse of the genesis of their impingement.

Ecological balance is indeed the eternal law of Nature for peaceful evolution, growth, and development. It is premised on the fundamental concept that nature is "a series of complex biotic communities of which man is an interdependent part". [13] However, what has happened is that in the pursuit of indiscriminate, reckless, accelerated development, the so-called 'civilized man,' who is only a part of the whole and yet trying to usurp the whole, either directly or indirectly, results in what is derogatorily described as, 'environmental degradation.'[14] Depicting the picture of utmost concern, the Supreme Court has recently stated:

> "The most potent threat faced by the earth and human civilization as a whole which is confronted with, today, is environmental degradation and wildlife degeneration. The need to protect flora and fauna which constitutes a major portion of our ecosystem is immediate. Development and urbanization coming at the cost of adversely affecting our natural

10 See, Virendra Kumar, "Basic structure of the Indian Constitution: The doctrine of constitutionally controlled governance [From His Holiness Kesavananda Bharati (1973) to I.R. Coelho (2007)] *Journal of the Indian Law Institute*, Vol. 49 No. 3 (2007) 365-398, updated in Virendra Kumar, "Statement of Indian Law - Supreme Court of India Through its Constitution Bench Decisions Since 1950: A Juristic Review of its Intrinsic Value and Juxtaposition," *Journal of the Indian Law Institute*, Vol. 58:2 (2016) 189-233.

11 See, Virendra Kumar, "Breach of the Doctrine of Public Trust: Lessons to be Learned in Environmental Protection," The Journal of Corporate Professionals Chartered Secretary, Vol. XXXII (2002), A 405 1293-A 409 1297.

12 See, Virendra Kumar, "Precipitant Role of the Supreme Court: Judicial Strategies in Environmental Protection [Latent Gains of The Motor Vehicles Case (1985)]," *Journal of the Indian Law Institute*, Vol. 44, No. 1 (2002), 37-61.

13 See, *State of Bihar v. Murad Ali Khan* MANU/SC/0470/1988: 1988 (4) SCC 655 (Para 8).

14 See, id., (para 10): Degradation is caused either directly through "excessive commercial hunting, or more disastrously, indirectly through invading or destroying natural habitats."

> surroundings will in turn impact and be the cause of human devastation as was seen in the 2013 floods in Uttarakhand and in 2018 in Kerala. The climate change is impacting wildlife by disrupting the timing of natural events. With warmer temperatures, flowering plants are blooming earlier in the year and migratory birds are returning from their wintering grounds earlier in the spring..." [15]

How to overcome and reverse such a 'degradation process' is the key question to ponder over. In our analysis, we wish to show how through the seeking of inherent integrity amongst the trio of legality, legitimacy, and sustainability, we are attempting to redeem the balance in the scheme of Nature. Towards this end, social scientists have conceived and coined the conceptual expression of 'sustainable development.'

The concept of 'sustainable development' is indeed a cumulative and comprehensive manifestation of all such aforesaid foundational principles[16] to protect, preserve, and improve the environment. This concept has emerged as "the answer" to resolve the dichotomy in the traditional notion that "development and ecology are opposed to each other."[17] The Supreme Court has made a statement, tracing the historicity of the usage of this expression, with all its antecedents and varying usages/nuances, and, therefore, needs to be quoted in full:

> "In the international sphere, "Sustainable Development" as a concept came to be known for the first time in the Stockholm Declaration of 1972. Thereafter, in 1987 the concept was given a definite shape by the World Commission on Environment and Development in its report called 'Our Common Future'. The Commission was chaired by the then Prime Minister of Norway, Ms. G.H. Brundtland and as such the report is popularly known as "Brundtland Report". In 1991 the World Conservation Union, United Nations Environment Programme and Worldwide Fund for Nature, jointly came out with a document called "Caring for the

15 *Tata Housing Development Company Ltd.,* para 25 (citing https://ww.nwf.org/Educational-Resources/Wildlife-Guide/Understanding-Conservation).

16 See, supra notes 11 and 12, and the accompanying text.

17 See, *Vellore Citizens' Welfare Forum v. Union of India*, MANU/SC/0686/1996 : (1996) 5 SCC 647 (para 10), cited In *Tata Housing Development Company Ltd.*, para 31.

> Earth" which is a strategy for sustainable living. Finally, came the Earth Summit held in June 1992 at Rio which saw the largest gathering of world leaders ever in the history -- deliberating and chalking out a blueprint for the survival of the planet. Among the tangible achievements of the Rio Conference was the signing of two conventions, one on biological diversity and another on climate change. These conventions were signed by 153 nations. The delegates also approved by consensus three non-binding documents namely, a Statement on Forestry Principles, a declaration of principles on environmental policy and development initiatives and Agenda 21, a programme of action into the next century in areas like poverty, population and pollution. During the two decades from Stockholm to Rio "Sustainable Development" has come to be accepted as a viable concept to eradicate poverty and improve the quality of human life while living within the carrying capacity of the supporting ecosystems. "Sustainable Development" as defined by the Brundtland Report means "Development that meets the needs of the present without compromising the ability of the future generations to meet their own needs". We have no hesitation in holding that "Sustainable Development" as a balancing concept between ecology and development has been accepted as a part of the customary international law though its salient features have yet to be finalised by the international law jurists."[18]

Be that as it may, consistently with the constitutional mandate of zealously protecting our environment, India also became a member of all major international conservation treaties related to habitats, species, and the environment, like the Ramsar Convention, 1971; the Convention on International Trade in Endangered Species of Wild Fauna and Flora, 1973; Convention on Migratory Species, 1979; Convention on Biological Diversity, 1992, among others. [19]

Our constitutional commitments have found expression in various enactments passed by the Parliament. For instance, to concretize the avowed objective of restoring ecological balance by especially protecting forests and wild animals,

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18 *Tata Housing Development Company Ltd.*, para 31.

19 See, *Tata Housing Development Company Ltd.*, para 25.

birds, and plants by preserving their natural habitats, including corridors for the free and uninterrupted movement of wild animals, the Wild Life (Protection) Act was enacted by our Parliament in 1972 to reinforce the provisions contained in the colonial era enactment, the Indian Forest Act, 1927.[20] Read with the protective provisions of the environmental law, these efforts towards "wildlife conservation" have resulted in the formation of the Wildlife Board and special projects like Project Tiger in the 1970s and Project Elephant in 1992, which attracted global attention.[21]

Commenting upon the need for especially enacting wildlife laws, the Supreme Court had stated, now more than three decades ago: [22]

> "[This was] the result of an increasing awareness of the compelling need to restore the serious ecological-imbalances introduced by the depredations inflicted on nature by man. The state to which the ecological imbalances and the consequent environmental damage have reached is so alarming that unless immediate, determined and effective steps were taken, the damage might become irreversible. The preservation of the fauna and flora some species of which are getting extinct at an alarming rate, has been a great and urgent necessity for the survival of humanity and these laws reflect a last-ditch battle for the restoration, in part at least, a grave situation emerging from a long history of callous insensitiveness to the enormity of the risks to mankind that go with the deterioration of environment."

In the predicament in which we are caught today, the colloquial 'million-dollar question' is, how to make progressive 'sustainable development' truly SUSTAINABLE without affecting or alienating the natural resources? Here, at this juncture, comes perhaps the most formidable critical function of establishing the legitimacy of legality in promoting environmental sustainability. In order to illustrate the impingement of the trio, I take up just two cases that have come to the fore most recently before the Supreme Court for judicial decision-making.

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20 The Indian Forest Act, 1927, which was passed during the colonial period for meeting some limited defined objectives.

21 See, *Tata Housing Development Company Ltd*., para 25.

22 *State of Bihar v. Murad Ali Khan*, supra, note 13 (Para 8).

The first case relates to considering the legality and legitimacy of the State law; namely, the Notification that was issued by the State of Tamil Nadu more than a decade ago in 2010.[23] Through this Notification, with the avowed of preserving forest life, the State of Tamil Nadu had notified an 'Elephant Corridor' in the Sigur Plateau of Nilgiris District. Consequently, all the resort owners and other private landowners were directed to hand over the vacant possession of the lands falling within the notified elephant corridor to the District Collector, Nilgiris, within a stipulated period. This notification was challenged before the High Court, which upheld its validity, and, accordingly, directed the petitioners to hand over the vacant possession within three months from the date of the judgment.[24] Against this holding, anappeal has come up before the Supreme Court in *Hospitality Association of Mudumalai* v. In *Defence of Environment and Animals and Ors.*.[25] In this case, the Supreme Court has examined the legality and legitimacy of the said Notification.

The first issue to be considered is whether the Notification is legal in terms of the competency of the State to issue it.[26] In other words, whether the State of Tamil Nadu is legally competent to issue such a Notification. In judicial determination on the touchstone of the Constitution, the Supreme Court has no difficulty in pronouncing that the State is empowered, nay, duty bound, to preserve the natural habitat of elephants by protecting and preserving the proposed corridor, even if it was on private forest land.[27] The clear and categorical judicial response to this end is: [28]

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23 Government Notification G.O.(Ms.) No. 125, dated 31.08.2010.

24 The High Court of Judicature at Madras upheld the validity of the Tamil Nadu Government vide their final judgment and order dated 07.04.2011, see, *Tata Housing Development Company Ltd*, para 2.

25 See, supra note 1.

26 The very first contentious issue raised in appeal before the Supreme Court by the appellant was that there was no statutory power for creating/recognition of new corridors by the State Government. See, id., para 39.

27 In the instant case, it was an admitted fact that the land of the Appellants had been notified as "private forest" in 1991 under the Tamil Nadu Preservation of Private Forests Act, 1949, which prohibits cutting of trees in private forests. This position stood fully supported by an earlier decision of the Supreme Court in *T.N. Godavaraman Thirumulkpad v. Union of India MANU*/SC/0278/1997 : 1997 (2) SCC 267 wherein felling of trees in the state of Tamil Nadu was prohibited in all forests, including forests situated in privately owned lands. See, id., para 39.

28 Ibid.

> "It is undeniable that the State Government is empowered to take measures to protect forests and wildlife falling within its territory in light of Entries 17A 'Forest' and 17B 'Protection of wild animals and birds' in the concurrent list and the power of the State Government under the Wildlife Act to notify Sanctuaries and other protected areas."

Having settled the issue of the constitutional legality of Notification, the Supreme Court has turned to examine, what we term as the legitimacy of the legality of Notification. This has been done in two respects. It has been done firstly by examining how the preservation of 'Elephant corridor' is necessary in the scheme of nature for the "long-term survival of the species" as well as to maintain "variance in the species' gene pool."[29] In order to substantiate the legitimacy of this vital principle of interdependence, the Supreme Court has drawn the inspirational support from the work done by the Wildlife Trust of India.[30] It has termed 'elephants' as the "keystone species", because owing to their characteristic "nomadic behavior" they play a critical role "in the ecosystem."[31] To wit, 'elephants' are described as the "landscape architects,"[32] "seed dispersal,"[33] providers of "nutrition," [34] and "Food chain."[35] In short, the preservation of "a large area for elephants to roam freely" amounts to creating the "umbrella effect," inasmuch

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29 See, id., para 35: "Legal intervention in preservation of these corridors has been necessitated because wildlife corridors are threatened by various social, economic and anthropogenic factors. Commercial activities such as running of private resorts and construction of new buildings with barbed and electric fences within elephant corridors pose a serious threat of fragmentation and destruction of habitats. The long-term survival of the species depends on maintaining viable habitats and connecting corridors which maintain variance in the species' gene pool and avoid other risks associated with habitat fragmentation and isolation of species."

30 The Wildlife Trust of India is an Indian NGO, committed to conserve **wildlife** and its habitat and to work for the welfare of individual wild animals and to eventually reduce Human-Animal Conflict,

31 See, *Hospitality Association of Mudumalai*, para 34.

32 Elephants create clearings in the forest as they move about, preventing the overgrowth of certain plant species and allowing space for the regeneration of others, which in turn provide sustenance to other herbivorous animals, see, ibid.

33 Elephants eat plants, fruits and seeds, releasing the seeds when they defecate in other places as they travel. This allows for the distribution of various plant species, which benefits biodiversity, see, ibid.

34 Elephant dung provides nourishment to plants and animals and acts as a breeding ground for insects, ibid.

35 Apex predators like tigers will sometimes hunt young elephants, and furthermore, their carcasses provide food for other animals, see, ibid.

as it "provides a suitable habitat for many other animal and plant species of an ecosystem."[36]

The second issue of legitimacy is reflected in the consideration of the proposed 'elephant corridor'. The issue before the Supreme Court in their decision-making in this respect is, whether the proposed 'elephant corridor' is merely hypothetical, arbitrary, or whimsical in nature. In other words, whether the Notification is grounded on any scientific study? This indeed is the issue of the intrinsic legitimacy, as distinguished from pure legality, of Notification.

In order to respond specifically to this issue, the Supreme Court has examined in depth the following question: whether setting up permanent concrete structures, such as building resorts/guest houses and other residential buildings, farming on lands, in and around the Nilgiris forest areas in the State of Tamil Nadu by their owners is consistent with the protection and preservation of the wildlife habitat?

For the protection and preservation of the natural environment, the apex court has invoked 'the Precautionary Principle', which has been judicially evolved in the course of constitutional development,[37] as a part of environmental jurisprudence in India. This principle has been ushered in as an anticipatory measure, which "makes it mandatory for the State Government to anticipate, prevent, and attack the causes of environmental degradation."[38] In light of this principle, the Supreme Court has unreservedly stated that "we have no hesitation in holding that in order to protect the elephant population in the Sigur Plateau region, it was necessary and appropriate for the State Government to limit commercial activity in the areas falling within the elephant corridor."[39]

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36 Ibid.

37 See, *M.C. Mehta v. Union of India and Ors.* MANU/SC/1123/1997 : 1997 (3) SCC 715 the "Precautionary Principle" has been accepted as a part of the law of our land. It makes it mandatory for the State Government to anticipate, prevent and attack the causes of environmental degradation. In the light of this development, in the instant case, the Supreme Court has no hesitation in holding that in order to protect the elephant population in the Sigur Plateau region, it was necessary and appropriate for the State Government to limit commercial activity in the areas falling within the elephant corridor. See, id., para 40. See also, supra, note 12 and the accompanying text.

38 Ibid.

39 Ibid.

The Supreme Court has, thus, affirmed the legitimacy of the proposed 'elephant corridor' in the State Government's recommendations vide their Notification, not merely on some hearsay[40] but on the judicious evaluation of the specific "material on record."[41] It is concretely based on "the factual findings of the High Court and also in the Government's adoption of High Court-appointed Expert Committee, through the impugned G.O."[42] The apex court, in our view, has further demonstrated the legitimacy of the 'elephant corridor' by specifically relating it to its geographical juxtaposition in the Sigur Plateau of Tamil Nadu: [43]

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40 During the course of adjudication, when conflicting maps about the proposed corridor were presented before the Madras High Court, the Court did not choose either of the maps at random. Instead., it directed the State Government to choose between: (i) the elephant corridors identified in the Wildlife Trust of India's book titled "Right of Passage-Elephant Corridors of India" which were referred to by the Central Government in its letter dated 11.08.2006 to the State Government; or (ii) the single elephant corridor identified by the Expert Committee appointed by the High Court. As per the aforesaid book titled "Right of Passage", the following 4 corridors lie in the Sigur Plateau region: (i) Avarahalla-Sigur, (ii) Kalhatti - Sigur at Glencorin, (iii) Moyar-Avarahalla and (iv) Kalmalai-Singara and Avarahalla. The Expert Committee examined all the elephant corridors in the area and identified a single elephant corridor comprising of various elephant corridors in the Sigur Plateau region. The State Government, vide the impugned G.O., notified this single elephant corridor, along the lines of the recommendations made by the Expert Committee. See, id., para 38.

41 Id., para 41. In fact, the contention of the appellant, that there was no real or visible movement of elephants in the area where their commercial structure stood, was repelled by the High Court in two distinct ways. One, by citing the past reported incident of "human-elephant conflict, which resulted in the death of a French tourist, in the region where the Appellants' resorts are located." Two, by pointing out that the so-called "absence of elephants from the areas surrounding the Appellants' resorts was, in fact, due to the construction activities of the Appellants whereby access of the elephants has been restricted through erection of electric fencing." Ibid.

42 Id., para 43. See also, id., para 38, showing how on the basis of the report of the expert committee, 'single elephant corridor' proposal came to be judicially accepted.: "Conflicting maps of this corridor were presented before the Madras High Court, which thus directed the State Government to choose between: (i) the elephant corridors identified in the Wildlife Trust of India's book titled "Right of Passage-Elephant Corridors of India" which were referred to by the Central Government in its letter dated 11.08.2006 to the State Government; or (ii) the single elephant corridor identified by the Expert Committee appointed by the High Court. As per the aforesaid book titled "Right of Passage", the following 4 corridors lie in the Sigur Plateau region: (i) Avarahalla-Sigur, (ii) Kalhatti - Sigur at Glencorin, (iii) Moyar-Avarahalla and (iv) Kalmalai-Singara and Avarahalla. The Expert Committee examined all the elephant corridors in the area and identified a single elephant corridor comprising of various elephant corridors in the Sigur Plateau region. The State Government, vide the impugned G.O., notified this single elephant corridor, along the lines of the recommendations made by the Expert Committee."

43 Id., para 37. Similar is the story of India's tiger conservation policy. India is the home to over 70% of the world's tiger population. She is committed to ensuring safe habitats for tigers and nurturing tiger-friendly ecosystems. "India's tiger conservation journey started in 1973 with Project Tiger with nine reserves; today, it has 50 tiger reserves in 18 states." However, this journey is far from being 'smooth.' Tiger Reserves 2018 report shows that "at least half of India's 50 tiger reserves are facing threats from linear infrastructure such as roads, highways and railway lines, fragmented forest corridors, poaching, pressure of human-wildlife conflict, mining, improper garbage disposal, and pollution.." and that this "frenzied infrastructure development can impact the genetic diversity of big cats." See, Editorial: "Tiger conservation: India's strides and challenges," *Hindustan Times*, July 30, 2021.

> "... It connects the Western and the Eastern Ghats and sustains elephant populations and their genetic diversity. The Sigur Plateau has the Nilgiri Hills on its southwestern side and the Moyar River Valley on its north-eastern side. Depending on the monsoon, the elephants migrate in search of food and water and during the course of their migration, they have to cross the Sigur Plateau. This migratory path is considered to be very crucial as it connects several contiguous forest areas forming the Nilgiri Biosphere Reserve in the states of Tamil Nadu, Karnataka and Kerala, the largest protected forest area in India."

This is how the claim of legitimacy of legality is upheld by the apex court in their decision-making for preserving and protecting our environment.[44]

The second case that we take up is *Tata Housing Development Company Ltd.*[45] This case is just the opposite of the first one at least on the factual matrix. In the first case of the *Hospitality Association of Mudumalai*, as we have seen above, the State of Tamil Nadu has proposed to create 'elephant corridor' to preserve and protect the flora and fauna through the issue of a special Notification. Whereas in the second case, *Tata Housing Development Company Ltd.*, the State of Punjab has sanctioned a highrise building project in favour of a private enterprise, namely Tata Housing Development Company Ltd.. The site of the project sanctioned by Nagar Panchayat, on close judicial scrutiny, was found to be a part of the area of Sukhna Lake in violation of the already notified norms, protecting Sukhna Wildlife

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44 See, id., para 45. Even for settling the legal and legitimate claims of the affected persons, including particularly the ones who were the owners of the private forest lands, the Supreme Court constituted a high powered 3-member Inquiry Committee. It consisted of: (i) Hon'ble Mr. Justice K. Venkatraman, Former Judge of the Madras High Court (Chairman); (ii) Mr. Ajay Desai, Consultant to World Wide Fund for Nature-India and Member of the Technical Committee to come up with a National Elephant Action Plan (NEAP), constituted by the Union Ministry of Environment, Forest and Climate Change (MOEF & CC); and (iii) Mr. Praveen Bhargava, Trustee of Wildlife First and Former Member of National Board for Wildlife. Its singular function was to decide the individual objections of the Appellants and any other persons claiming to be aggrieved by the actions of the District Collector, Nilgiris pursuant to the impugned G.O. See, paras 43 and 44. See also para 40 (citing MANU/ENVT/0189/2019), showing that the Notification of 2010 is in line with the later Notifications of the Central Government: The Ministry of Environment, Forest and Climate Change vide its Notification S.O. 4498(E), dated 13.12.2019, has declared the entire Nilgiris forest areas in the State of Tamil Nadun, and adjoining areas around the Mudumalai Tiger Reserve as an Eco-Sensitive Zone. Under this Notification, the State Government of Tamil Nadu has been expressly directed to regulate land use generally, as well commercial establishment of hotels/resorts specifically, in the Eco-Sensitive Zone so established.

45 See, supra note 1.

Sanctuary. Besides, the proposal made by the Punjab Government, confining the Buffer Zone to 100 meters, was not accepted by the Ministry of Environment and Forest, Government of India. [46] The legitimacy of not accepting shrinkage of the buffer zone was that "[t]he total forest cover in our country is far less than the ideal minimum of 1/3rd of the total land", "[w]e cannot, therefore, afford any further shrinkage in the forest cover in our country."[47] Accordingly, the sanction granted by Nagar Panchayat has been held by the Supreme Court as void.

In the first case, the Supreme Court upheld the legitimacy of the State action *via* its Notification, because it intended to safeguard the flora and fauna as envisaged under the Constitution. In the second case, the Supreme Court invalidated the approval by the Government of State of Punjab, inasmuch as the sanction obtained by it from the local body, which is statutorily empowered to clear such projects, was found to be illegal. The irony of the system in the second case is that the very State, which is obligated to conserve the environment as 'trustee' of the people, itself became a 'collusive' party of the destructive project! The Supreme Court has been, therefore, constrained to state rather sharply: [48]

> "[I]n our opinion, no such project can be allowed to come up in the area in question. The State of Punjab was required to act on the basis of Doctrine of Public Trust. It has failed to do so. The origination of the project itself indicates that State of Punjab was not acting in furtherance of Doctrine of Public Trust as 95 MLAs were to be the recipients of the flats. It is clear why Government has not been able to protect the eco-sensitive zone around a Wildlife and has permitted setting up of high-rise buildings up to 92 meters in the area in question, which is not at all permissible."[49]

Observing that in "such a scenario when the authorities have failed to protect the wildlife sanctuary eco-sensitive zone," seemingly for the reason that the

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46 See, *Tata Housing Development Company Ltd.*, para 37.

47 See, id., para 29, citing *Pradeep Krishen v. Union of India*, MANU/SC/0505/1996: (1996) 8 SCC 599.

48 Id., para 36.

49 In the light of the facts and circumstances of the case presented before it, the Supreme Court has found that "considering the distance of 123 meters from the Northern side and 183 meters from the Eastern side of the project in question from wildlife sanctuary," the sanctioned project was in in clear violation of the limits in vogue. Ibid.

beneficiary of the project involved "a large number of MLAs of the Punjab Legislative Assembly," "(t)he Court has to perform its duty"[50] as a protector of fundamental rights of the people. Since the "entire exercise smacks of arbitrariness on the part of Government including functionaries," the whole process of "obtaining clearance relating to the project" has been "quashed" by the Supreme Court. [51] This is how, on the touchstone of legitimacy, the so-called legal processes initiated by the State government were annulled in the service of 'sustainable development'!

In this backdrop, ponderingly, we ask: where should we go from here in the realization of the goals of 'sustainable development' through the 'trinity' of legality, legitimacy and sustainability? Hitherto, in the relentless pursuit of unbridled development, which is solely and singularly subsumed under the rubric of ECONOMIC GOALS, problems of environmental degradation galore. The damage caused to the ecosystem is simply stupendous. On many counts, it is irreversible too! Such a sad spectacle is a global phenomenon. And the situation of environmental degradation is getting murkier and more complex day by day.

A couple of months ago, the draft Report from the United Nations' climate science advisors, inter alia, revealed the pathetic picture that is emerging in the wake of 'climate change': "Climate impacts to hit sooner. Species extinction, more widespread disease, unliveable heat, ecosystem collapse, cities menaced by rising seas- these and other devastating climate impacts are accelerating and bound to become painfully obvious before a child born today turns 30."[52] Now, the full report of UN Intergovernmental Panel on Climate Change, "Climate Change 2021: The Physical Science Basis," was released on August 9, 2021.[53] This Report is perhaps the most authenticated document on the pernicious impact of climate change owing to carbon emissions. [54] The United Nations has called this Report a

50 Id., para 37.

51 Ibid.

52 See, "Climate impacts to hit sooner – UN report," Hindustan Times, June 24, 2021.

53 See, "Code red: UN report rings climate alarm," *Hindustan Times*, August 10, 2021

54 This report is reported to have been drafted by 234 scientists from 66 countries (running into 3,949 pages) on the basis a comprehensive analysis of 14,000 scientific papers by experts. Ibid.

"code red for humanity," and that "It's just guaranteed that it's going to get worse."[55] The end result of the whole exercise, as put it by one of the report's authors, Linda Mearns, [56] during the course of its release is: "I don't see any area that's safe... Nowhere to run, nowhere to hide."[57]

The singular solution sought to surmount the degradation problem, proffered generally and even universally, is invariably always characterized by a 'techno-centric' approach. On behalf of India, for instance, which is labelled as the third largest (after the USA and China) annual polluter of carbon dioxide [CO2], it has been argued that in order to meet the net-zero commitment without compromising developmental goals, the developed countries, who are the major polluters and also have more resources, must fulfil their "technological transfer and financial-aid commitments to developing countries."[58]

The 'techno-centric' approach is inherently promotive of 'economic interests,' which, in turn, deepens the divide between the 'developed' and 'developing' nations, the 'rich' and 'poor' within the complex of communities, and the people of the same nation. And, which is indeed a matter of still much more serious concern, the techno-centric approach, instead of minimizing environmental degradation, eventually itself results in aggravating it, albeit in disguise, subtly and silently.

In the realization of the value of Sustainable Development through the complex of legality, legitimacy and sustainability, we may have to resile from our dependence purely upon the imported sophisticated expensive technology and move more towards the *atamanirbhar* 'grass root innovative technology' as a tool to fulfil human's basic demands. In other words, self-reliant technology

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55 Ibid. If the current rate of carbon emissions continues, in the next 20 years, the world will exceed the 1.5 degree Celsius by 2100, which would be catastrophic.

56 Linda Mearns is the Director of the Weather and Climate Impacts Assessment Science Program (WCIASP) and Head of the Regional Integrated Sciences Collective (RISC) within the Institute for Mathematics Applied to Geosciences (IMAGe), and Senior Scientist at the National Center for Atmospheric Research, Boulder, Colorado.

57 See, supra note 53 (HT August 10]

58 See, Editorial: "Dire Necessity," *The Indian* EXPRESS, August 11, 2021.

should be harnessed to meet essential basic needs of all humans, rather than the technology itself becoming the productive source of creating and meeting newer needs of the fewer ones at the cost of **infinitely many**!

The COVID-19 pandemic period of a year-and-a-half must have made us realize the critical difference between the essential and non-essential needs, and how the drastic cut on the latter has improved the quality of our social life instead of affecting it.[59] We have learnt the values of frugality, austerity, simplicity, atmanirbharta (self-reliance) and mutuality of sharing, thereby at once conserving our precious resources and preserving our environment. The somber pandemic period of relative isolation must have prompted us to recall and revisit our great social institutions of Hindu Joint Family (HUF) and Mitakshara Coparcenary, which conceptually continue to be an integral part of our peaceful social living. I have vehemently argued, more than a decade ago, that the whole concept of *Mitakshara coparcenary and* the Hindu Undivided Family continue to be a part of our governing LAW, although in the format of uncodified law, and that statutory interventions through the Hindu Succession Act of 1956, as amended

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59 Within few months after the break of coronavirus in February-March, 2020, I had the opportunity of reflecting on its aftermath, albeit entirely in a different context – while writing an article on "Revisiting Gandhi in Our Contemporaneous World," published in *Sambhāṣaṇ*, Volume 1: Issue 07, November 2020, at pp, 104-126. I would like to quote a para (without accompanying footnotes at pp. 125-126) to show why and how we should move away from the 'consumerist culture' towards the culture of 'frugality and simplicity':

> "The continuing Covid-19 phenomenon has prompted us to realize the mantra of 'Stay home, and stay safe,' almost as an integral part of our social living. With indefinite prolongation of coronavirus, now for months together since its outbreak in early March 2020 and showing no signs of retrieval or abating, the world is "learning to live with coronavirus," else we are destined to be mowed down by the sheer weight of "crippled economies." The glooming prospect of Covid-19 has, thus, led us to discover new normative rules of social living. We are now cooking our own meals, washing our own clothes, cleaning our own toilets and bathrooms without the availability of part-time services of maids residing in close-by colonies. We are, per force, required to maintain our own lawns and kitchen garden without seeking the assistance of a regular or part-time professional and not-so-professional gardeners. With the lurking fear, turning out increasingly to be more real than imaginary, of being caught by coronavirus, we are learning afresh to forego the pleasure of going to theatres, restaurants, excursions, et al. All this is significantly and substantially changing the pattern of our living in the matters of consumption.
>
> Aren't the new emerging patterns of life leading us to be self-contained and self-reliant to the best possible extent? Aren't we learning to live the life of simplicity by critically differentiating the essentials of life from the non-essential ones? May be, we might be motivated to move towards re-establishing the social order, whose foundational values are rested on the genuine welfare concern for 'others', as passionately pursued by Gandhi. May be, with the stamp of Gandhi-Prithvi Singh's first-hand pragmatic experience, at least with respect to some of the new emerging norms under the shadow of Covid-19, prove to be a 'blessing in disguise'! Don't we feel motivated to willingly accept and adopt those so-called 'abnormal' norms as truly healthy 'normal' norms of life even after the impending danger of coronavirus is over?"

by the Act of 2005, have not hitherto abolished it. [60] In fact, most recently I have the opportunity to reiterate in my interaction with young scholars that, in my submission, it would be palpably wrong to sacrifice the concept of *Mitakshara* Coparcenary, for it is premised on the notion of *Dharma* (duty), which represents one of the core values of Hindu Philosophy.[61]

The defining value characteristic of Mitakshara coparcenary and undivided joint family system is 'community of interest and unity of possession'; that is, the interest of one is the interest of all, and likewise the possession of one is the possession of all. Such a notion is built upon joint family property, which is inalienable except under trying conditions. Under the classical Hindu law, the *Karta* of the family is empowered to alienate only for three singular purposes, which are abbreviated as, *kutumbarthe* (for the benefit of the family), *apadarthe* (during the time of distress), and *dharmarthe* (for charitable purposes), and for no others. In this mutually supportive system, every member of the family shall contribute according to one's own capacity, and take according to one's own needs. The functional centrality of all these concepts lies in using the natural resources in such a manner as to meet the needs-not only of the present but of all generations to come. Such an institutional arrangement evolved and sustained during the course of long history of thousands of years.

What is remarkable about this institutional social setup, which is worthy of emulating even today? In the context of 'sustainable development', we may venture to state that in the evolution and development of a social structure that discouraged alienation of common resources, there was perfect integrity in the normative universe of legality, legitimacy, and sustainability. And this integrity became ingrained in the lifestyle of an individual as his prime *Dharma* (righteous course of duties) in the service of humanity. As a cultural phenomenon, it was

60 See, Virendra Kumar, "Crucifying the concept of Mitakshara Coparcenary at the altar of income-tax law (A critique of Chander Sen (1986) and catena of cases dittoing its decision-principle)," *Journal of the Indian Law Institute*, Vol. 53 (2011) 413-436.

61 See, Virendra Kumar, "Rule of Law envisioned through the prism of Hindu Philosophy." A lecture delivered at the Two Week Capacity Building Programme (Online) on "Comparative Public Law and Hindu Philosophy: Research and Teaching Dimensions in 21st Century India," organized under the aegis of Centre for Comparative Public Law, Himachal Pradesh National Law University, Shimla, in association with the Indian Council of Social Science Research, New Delhi, on July 29, 2021. This lecture is being published by HPNLU in their Monograph.

the *dharma* of every individual to dedicate his doings in the service of society by reminding himself in his daily prayer: "*Sarve bhavantu sukhinah; sarve santu nairaamaya, Sarve bhadraani pashyantu maa kaschit dukhabhaag bhavet*". ["May all be happy, all be free from disease, all be witness to auspicious events and no one has to be a part of sorrows] and that *Vasudhaiva Kutumbakam* [the whole world is one big family].

It is these foundational value principles of *Dharma* that went into the making of our own Constitution of independent India– the *Constitution of India*. While participating (on January 20, 1947) in the Constituent Assembly Debates on 'Objectives Resolution', introduced by Jawaharlal Nehru on December 13, 1946, and passed on January 22, 1947, Saravepalli Radhakrishnan echoed the underlying principles of the Constitution on the strength of Hindu Philosophy by observing: "*That Dharma (righteousness), not the ruler, has been the sovereign in the land of Vedas.*" *"Dharma is the king of kings. It is the ruler of both the people and the ruler themselves. It is the sovereignty of the law.*"

All this implies is that if we make the philosophy of *dharma* the pivotal point of an individual's behavioural actions, which would guide him towards simplicity, austerity, and joy of sharing, the result would be moving, slowly but steadily, towards saving our environment from increasing degradation. Should we forget that worshipping the elements of nature – *Prithvi* (earth), *Jal* (water), Vayu (air), *Teja* (light), and *Aakash* (space), collectively called *Pancha bhoota*- is integral to Indian culture since time immemorial, for out of these elements is born our life-supporting physical universe! In this milieu, hopefully, we shall realize the integrity between and amongst legality, legitimacy, and sustainability. Such a move in no way runs counter to all that is being done at the national or international

level[62] to meet the menace of threatening 'climate change' caused by the ever-increasing industrial activities of all sorts polluting the environment.[63] Nor making the shift in human lifestyle would cost much to the State exchequer,[64] except perhaps losing some revenue on non-essential items of luxury for the 'nouveau riche' (new rich)! On the contrary, such a shifting pattern of moving away from the modern 'consumerist culture' is in perfect harmony with the time-tested and foundational principle of *dharma* (with a unique emphasis on the welfare of all– *sarve bhavantu sukhinah*), which, by virtue of self-driven force from 'within', has the potential of making individuals and the society truly atamnirbhar,[65] and,

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62 On World Environment Day (June 5), Prime Minister Narendra Modi announced that the target of 20% ethanol blended petrol has been advanced by five years to 2025. Ethanol is ethyl alcohol that is made from molasses, grains, and farm waste. The ethanol-blending programme is one of the seven key drivers identified for India's energy map — gas-based economy; cleaner use of fossil fuels; greater reliance on biofuels; achieving the renewables' target of 450 GW by 2030; increasing contribution of electricity to decarbonise mobility; moving into emerging fuels such as hydrogen; and digital innovation across all energy systems. See, Editorial: "The importance of the PM's ethanol push," *Hindustan Times*, June 6, 2021.

On August 18, 2021, the Government of India approved India's ratification of the Kigali Amendment to the Montreal Protocol on phasing down climate-damaging refrigerant Hydroflurocarbons (HFCs). Under its commitment to the Montreal Protocol, India will complete its phase down of HFCs, used in air-conditioners, refrigerators and insulating foams, in four steps from 2028 onwards with cumulative reduction of 10% in 2032, 20% in 2037, 30% in 2042 and 80% in 2047 over 2024-26 baseline. In comparative perspective, different countries have different phase down plans under the Protocol. The developed countries including the US, Canada, west European nations and Japan will reduce HFC use first, followed by China and then by 10 developing countries including India, Iran, Iraq and Pakistan. Overall, the action is expected to reduce HFC use by 85% by 2045 over different baselines by different countries. See, Editorial: "Walking the talk on climate commitments," *Hindustan Times,* August 20, 2021.

63 The degradation of land is one of the adverse impacts of increasing industrial activities. It is lowering "the productive capacity of land". According to United Nations' estimate, "one-fifth of earth's land area — more than 2 billion hectares — is degraded." "More than 3.2 billion people worldwide are at risk from the effects of land degradation, many of whom live in the world's poorest regions." "The loss of land productivity contributes to the climate crisis (as the loss of plants makes it harder to draw excess carbon dioxide from the air)." "Desertification has occurred throughout history. But what's alarming is that its pace has accelerated 30 to 35 times the historical rate in recent decades." See, Editorial: "An underrated ecological crisis," *Hindustan Times,* June 17, 2021.

64 In the most recently launched first Mumbai Climate Action Plan (MCAP) by the Brihanmumbai Municipal Corporation (BMC), we tend to discern a refreshing shift from over-dependence on the imported sophisticated technology to the relatively simple home-spun techniques to meet the menace of 'climate change.' Mumbai is part of the C40 Cities climate leadership network and the drafting of the plan, in collaboration with World Resources Institute India. The plan will focus on six areas of common concern - waste management, sustainable mobility, clean energy, urban floods and water management, urban green cover and biodiversity, and air quality. See, Editorial, "Climate plan: Mumbai shows the way," Hindustan Times, August 31, 2021.

65 For a perspective, that to meet the challenges of climate change, "India must not depend on West for clean tech transfer," and that the "Best strategy is to incentivise domestic R & D," see, Editorial, "Green On Your Own," The Times of India, August 11, 2021.

thereby, their behavioural actions 'sustainable,' eventually resulting in 'sustainable development'.[66]

66 For the causal effect between 'human activity' and 'environmental degradation', see, Anirudh Sridhar, "Designing a climate crisis law for India," Hindustan Times, August 25, 2021, observing: "The latest Intergovernmental Panel on Climate Change (IPCC) science report *asserts more boldly than before the causal relationship between human activity and global warming*." The suggested framework to meet the situation is: "enabling law that cradles research and prompts investment in green technology might be far more effective in securing India's long-term economic prosperity than a hastily enacted net-zero or carbon-capping law, which might prove ineffective, unenforceable, or debilitating." [Emphasis mine]

Integrating Education for Sustainable Development (ESD) into Geography Curriculum at University Level in India

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BACKGROUND

Education for Sustainable Development (ESD) has been recognized as the medium through which the Sustainable Development Goals are to be realized (UNESCO 2015b). ESD is now being looked at seriously all over the world. ESD has taken some time to evolve in itself. In most of the countries around the world, it has been highly localizing and finding its place through various ways into the curriculum.

Concept of ESD

Education for Sustainable Development (ESD) is a type of education in which teaching practices, pedagogies, learning objectives, learning outcomes are oriented and designed for sustainable development. It is a type of education which makes the learners sensitive to pressing developmental issues like climate change, disaster management, poverty alleviation, peace and conflict issues, conservation of resources, etc. ("UNECE" 2003) ESD is not only the education for creating awareness regarding environment or eco-system. It is not just environment education. It is about using various tools and techniques to make the learners adapt to all challenges that lie ahead in the way to achieve sustainability. Thus, there are two components in ESD- the 'E" i.e. education. It means that there has to be a specific pedagogy, teaching practices, learning objectives, outcomes

and competencies that are expected from learners. The other aspect is the "SD" i.e. Sustainable Development. It means development which is for the future of all, which takes into account everyone's needs. According to the Bruntland Report 1987, it is the 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'. ESD needs to be integrated with formal, informal and informal learning (UNECE).

History of ESD

It has evolved from its nascent framework format in various conferences. Let us look at how it has developed in various conferences which have taken place on the issue of Sustainable Development. In 2002, at the World Conference on Sustainable Development in Johannesburg, South Africa, the member countries agreed that more progress on ESD should be carried out seriously. The concept of creating a UN Decade of Education for Sustainable Development (UNDESD) was discussed and endorsed by many nations. The UN Decade (2005-2014) was declared through a resolution by the UN General Assembly (57/254). It was during the UNDESD that formal education systems, those who were responsible for development of discourse on education for their nation's progress, began to take more notice of ESD as part of their responsibility. In 2012, as the decade was ending, nations called for a continuation of the work begun during the UNDESD and requested UNESCO to develop a continuing strategy/framework. In 2014, at the World Conference on Education for Sustainable Development in Aichi-Nagoya, Japan, ministers of education adopted a declaration containing 360 commitments and calling for urgent action to mainstream ESD and include it in the post-2015 development agenda. At this meeting UNESCO launched the Global Action Programme on ESD (GAP) highlighting 5 priority areas for action. The GAP has proven useful in maintaining the momentum of ESD that has now emerged as a crucial implementation element in the Sustainable Development Goals. In 2015, at the World Education Forum, at Incheon, Korea, Ministers of education adopted a global education strategy to implement SDG 4 entitled Education 2030. This would be their contribution to the 2030 Agenda and the 17 SDGs. By merging the concepts of Education for All and ESD, as was initially envisioned in Agenda 21, (both initiatives emerged simultaneously in different forums in the late 1980s) the

new overarching vision of ESD is thoroughly identified in the 2030 Agenda as of crucial importance. (“AGENDA 21” 1992) , (UNESCO 2015a)

ESD in India

In India, ESD has not taken a very serious form into the curriculum. It is still in the form of environmental education where awareness regarding environment is imparted through a compulsory component in schools and colleges. Environment education has become compulsory in India after the Honorable Supreme Court in its judgment of 18 December 2003 directed that the NCERT shall prepare a Model syllabus of Environment Education. The NCERT developed the Model syllabus and submitted it to the Honorable Supreme Court. (Ray G.N. 1991) This has paved way to making environment a part of education.. However environment education doesn’t include sustainable development in the way ESD does. Finally, new tools and more decentralized approaches are required for the sustainable development with crucial role of educational institutes, especially of higher education. Many faculties are working within 4 regulatory bodies under MHRD such as UGC, AICTE, Distance Education Council (DEC) and Council of Architecture (CoA), which are also dedicated for the sustainable development through higher education course. (Sharma 2014)

So in schools, environment education has become a non-marked subject and in colleges, it is a compulsory component to be taken up once in three or four years. Further, subjects like Geography, Economics, Biology and Environment Science which are pertinent to environment have additional papers at the Bachelors or Masters level. As per the goals to be achieved by SDGs for which many governments have taken the goals seriously. The Indian Government has also adopted the SDG Framework in 2015 and hence serious towards achieving the Quality Education goals (21Oc). ESD has been identified as the way to bring about sustainable development through education. The SDG goal 4 states , “*by 2030 ensure all learners acquire knowledge and skills needed to promote sustainable development, including among others through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship,*

and appreciation of cultural diversity and of culture's contribution to sustainable development ' ("SDG," n.d.)

This is a major shift towards the way we impart education in India. This means that it should go beyond EE. The Goal suggests that no matter what stream of education one chooses, it should be compatible with Sustainable Development. It suggests that all streams of education should include Sustainable Development and the knowledge they impart should adopt all practices oriented towards Sustainable Development.

Understanding sustainable development and the ESD approach

The ESD goes beyond theories. When applied to education, sustainable development cannot be theoretical, as defined by the concept of 'planetary boundaries' (Stockholm Resilience Centre) or 'social thresholds' as in political resolutions. In education, this principle offers orientation in the learning process and fosters sustainability as a 'frame of mind'.(Bonnett 2002) It suggests that under sustainable development lies the notion of a right relationship with nature which both conditions our attitudes towards the environment and our sense of our own identity. (Bonnett 2002).

Figure 1 Dimensions and main goals of sustainable development. (Siege. 2016)

The Framework suggests various structures in which ESD can be 'embedded' in the education structure. Having ESD or EE as a subject represents weaker structures while integrating ESD into each and every course or curriculum represents stronger structures.

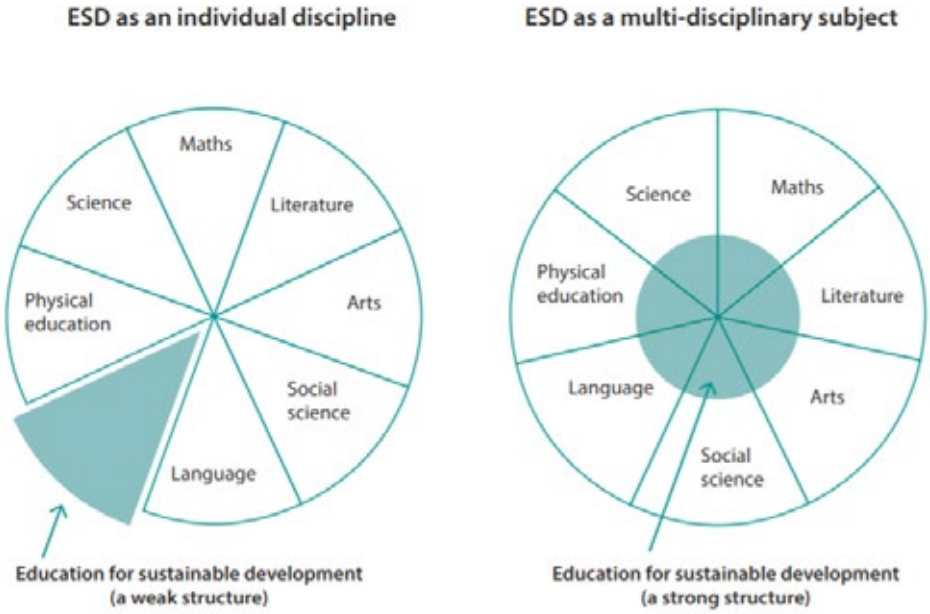

Figure 2 Source:(UNESCO, n.d.)

The paper follows the latter structure where the authors are talking about the way in which we integrate ESD into the curriculum of Geography taught in Universities in India.

GEOGRAPHY CURRICULUM IN INDIA AT THE UNIVERSITY LEVEL

GEOGRAPHY AND ESD

Geography has always been an inter-disciplinary subject. Peter Jackson has rightly said, "When you meet people at a party and tell them you're a geographer, they tend to ask you about distant places, capital cities and longest rivers. In my experience, they rarely ask you about globalization, sustainability, inequality or

the other big issues about which geographers actually have a lot to say" (Jackson, n.d.)

This highlights how Geography can be oriented towards integrating ESD into Geography curriculum. Let us look at how this can be done. There are two ways in which this can be done: 1) Contribution of Geography as a discipline to SDGs, world peace and globalization 2) Ways and methods to bring the link mentioned in point number 1 into Geography through various tools- a 'built-in' approach. (Lotz-Sisitka, Heila; Arjen EJ Wals, David Kronlid 2015)

ESD COMPETENCIES

Integrating the curriculum will result in development of competences. There are 8 competencies identified for ESD. Each competency can be developed by making required changes in the curriculum of various papers in the syllabus.

Having studied the syllabus of many universities across India like the Aligarh Muslim University, Delhi University, Pune University and Mumbai University, we have come across the following conclusions regarding how to integrate ESD into the curriculum with respect to the competencies to be developed.

Competencies	**ESD Integration into Curriculum (Examples)**
Systems thinking competency	Geography as a discipline, connection between physical and human geography , international migration or global food problem, concept of scale in geography , rock cycle in Geomorphology
Anticipatory competency	Urban Geography, climate change, regional planning, disaster management
Normative competency	Urban Geography, climate change, Agricultural Geography
Collaboration competency	Statistical data collection, practical geography, Disaster management
Critical thinking competency	Resources Geography, Disaster Management, Agricultural Geography
Self-awareness competency	Human Geography, Disaster Management
Integrated problem-solving competency	All branches of Human Geography
Strategic competency	All branches of Human Geography

Table 1 Examples from Geography Curriculum to develop ESD Competencies
Source: (UNECE 2011), examples from geography curriculum given by Authors

Let us look at the various ways in which Geography can contribute in SD and how curriculum can be oriented towards ESD.

1) Re-looking at basic concepts of Geography

Geography is all about space (Place), time, distance and scale. Place in Geography is about the way we occupy the space. It could be a human habitation, a city, a forest, a small square or any space which has a location on the earth. For ESD, the concept of space holds great importance. Be it a dense city in a tropical country or a sparsely populated village in a cold country, both places will have their own issues, own problems and also look at own 'localised' situations. For example, if both the places world towards controlling their carbon emissions, there will be no 'one-size fits all' solution for both. The study of place allows us to identify dynamics of power and social relations present in society and this is important for ESD. Some parts in a city have different types of infrastructure. While slums might have issues related to access to toilets and water supply, there would be other parts in the city which may face higher logging because of the slope. This brings about equity and equitable distribution of resources with respect to space. Even naming of spaces has an importance. Also, every space has a different meaning to different people. For e.g., a 'devrai' (sacred grove) has a great spiritual importance to the community which owns, whereas it's a profitable resource for private companies. . This is the way the concept of ESD should be integrated in Geography curriculum. 'Time' is important because we have set goals (2030). Time is important in ESD and in geography. For example, in America in 1960, cars were allowed in the center part of the cities. This was a central theme in planning the cities but now, public transport has now gained momentum. Now, cities are rethinking these spaces with respect to public transport. "Scale' shows localization in ESD which is an important concept in education. We need to talk about local, regional, national and global scales in ESD. Local resources, local solutions and local economy is important for sustainable development.

2) Bringing together Physical and Human Geography

Geography is majorly divided into its two branches: Physical and Human Geography. The concept of actors plays an important role in defining both. The 'human' actor is absent in Physical Geography. In Human Geography, 'human' is the main actor. At present, the curricula do not culminate both the branches. They

are taught individually. For example, in Physical Geography, volcanic activities are taught. Plates, plate boundaries and distribution of seismic regions on the earth is shown. In Disaster Management under Human Geography, natural hazards are taught and how volcanic activities affect human habitations. To integrate ESD into this topic, for example, focus can be laid on highlighting how different communities have been coping with disasters. Haiti and Japan for example, both are located in earthquake prone areas but it is important to understand that Haiti gets affected more than Japan. How humans reduce their vulnerabilities is important whether it is physical or human geography. Vulnerabilities are also different in various human settlements. Poor and those living in slums are more vulnerable to floods.

Another duality in Geography is about determinism and possibilism. In both the approaches, 'nature' and 'human' are the main actors. But a mid-way between the two extremes is another approach in geography which has been given by Griffith Taylor in 1950s. It is called "Stop and Go Determinism". ESD needs such an approach. Geography surely has a great approach to contribute to study ESD using Neo-determinism or Stop-and-go-determinism.

3) Regional Geography:

Geography curriculum is incomplete without Regional Geography in any university in India. Generally, the course on 'Regional Geography' in universities contains the Geography of the respective States i.e. The Geography of Rajasthan or Madhya Pradesh or Maharashtra etc. For orienting this course towards ESD, it is necessary to include a more local geography into the curriculum. This paper can also include a local geography of the district. For example, one unit can be localized by including the Geography of the District. This will make the students aware of their local issues, local resources and thus will be better equipped to give local solutions towards sustainability. It will also make them understand 'consumer ethics' and various aspects of fair trade which hold central place in ESD. This approach is found in school curriculum where district geography starts in Class 3. After that, it goes on to the country, continental and global level. It is necessary to bring this again at the college level studies through geography syllabus. The new NEP 2020 also talks about this bottom-to-top integration in the curriculum. (Gohain 2021)

4) Economic Geography

This is an important course in Geography curriculum which talks about resource distribution, industries, trade, tourism and various types of human activities. This paper can also accommodate various facets of ESD in a very effective way. Distribution of resources is related to equity and equality, concept of dumping, fair trade, scarcity of resources and responsible consumerism can find their ways in this paper. How communities have been judiciously using scarce resources needs to be included. A greater stress on conservation of resources should be given through effective examples from local areas. Students should be more locally aware and connect globally. For example, when Amazon forests were burning in forests, many of the geographers felt bad about it. But how aware are we about the forest resources found around us.

5) Statistical geography

This paper has been an integral part of the geography curriculum. The syllabus needs to take into consideration the real-life examples related to Sustainable Development. While using statistical techniques, students can be asked to verify the mathematical and statistical claims made by social or other organizations, or to engage in collective data gathering to track phenomena across contexts. Sums and exercises which gather complex interrelationships among poverty, hunger and maternal and child mortality can be given. Each of these phenomena may be considered in any given context or in comparison across contexts. Students can also be given exposure to various indices related to Global Poverty Index, Environmental Sustainability Index or handprint and footprint similar indices which helps them calculate and learn about how they can learn about ESD.

6) Maps and Surveys

Data collection is also important in Geography. Maps are ways to represent the data. We use very specific maps in our courses - distribution of coal, State capitals of India, seismic zones of India, global distribution of trade routes and transport routes, etc. To integrate ESD, we need to be more specific in mapping. Our students need to map various characteristics or their own communities. For example, students can show on a local map, those places where they find the most beggars. Or they can map those roads which have the highest tree density.

Such mapping exercises can give them a new insight towards sustainable development.

USING GEOGRAPHICAL PEDAGOGIES IN ESD

'Geographical investigation both satisfies and nourishes curiosity. Geographical perspectives help deepen understanding of many contemporary challenges such as climate change, food security, energy choices, overexploitation of natural resources and urbanization. Teaching geography serves several vital educational goals. Building on people's own experiences, learning geography helps them to formulate questions, develop their intellectual skills and respond to issues affecting their lives. It introduces them not only to key 21st century skills but also to distinctive investigative tools such as maps, fieldwork and the use of powerful digital communication technologies such as Geographic Information System' (International Charter on Geographical Education, 2016, p. 5).

Conclusion:

The pedagogies and learning outcomes are important parts in geography curriculum. Thus, to integrate ESD into the geography curriculum we will also have to redesign our learning outcomes and re–orient our teaching methodologies. Need to bring in more tools and activities and go beyond classrooms as we have already been doing in our field trips and surveys in Geography. We need to develop competencies which are required for ESD in our geography students. Critical thinking, system thinking, anticipatory competencies, etc. need to be developed through the curriculum. Such skills will be helpful to the students in enriching life skills and job prospect too.

We can surely conclude that integration of ESD into the geography curriculum is not an uphill task. It will in fact make Geography more popular amongst the students.

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Ocean Sustainability: Risks, Challenges and Opportunities

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Abstract

Oceans have been a source of food and numerous resources for humanity since the advent of civilisation. With an increasing population on land to feed, this dependence on ocean for food and resources has increased many folds. While the oceans have been resilient so far allowing numerous misadventures of humanity, they have reached a tipping point in their resilience due to the use of unsustainable methods. Realising the need to rejuvenate the oceans and avoid a possible destruction of humanity if business-as-usual continues, the United Nations adopted the Sustainable Development Goals 2030 in 2015. So as to appreciate and discuss the risks, challenges and opportunities to achieve the desired ocean sustainability, the article will discuss each of these aspects independently while showing their close interdependence and impact on ocean health and stability. In doing so, the discussion would be limited to the Asia-Pacific region.

Keywords: Asia-Pacific; sustainability cycle; carbon cycle; carbon emissions

1. Introduction

The marine environment is a strongly interconnected environment. However, the stability and resilience of this environment has been drastically disturbed due to anthropogenic activities/events either directly or indirectly. Since the oceans are a major source of food, medicines, clean energy, job creation, and generation of most of the oxygen we breathe while supporting the global economy through tourism, fisheries, shipping and trade, they need to be exploited sustainably to ensure that they can continue to absorb the anthropogenic impact and provide the required goods and services in the future too.

This need forced humanity towards sustainability focused studies to help policy makers in developing a road map for the future; resulting in the United Nations to adopt Sustainable Development Goals (SDG) in September 2015 with Goal 14 dedicated to conservation and sustainable use of marine resources and ocean health (UN, 2015). However, to ensure ocean sustainability, there exist numerous risks that need to be understood to appreciate the associated challenges that inhibit achieving the desired objective. Since ocean sustainability cannot be compromised and is considered essential to ensure a healthy and safe future of the planet and the future generations, it is imperative to look at existing opportunities to achieve the desired ocean sustainability while working towards future opportunities for greater sustainability.

It is with this understanding that this article aims to discuss the risks, challenges and opportunities to achieve ocean sustainability in the same breath. In doing so, each of these will be discussed independently while showing their close interdependence on each other and on the ocean health and stability. To make the discussion relevant and comprehensible, the discussion will be limited to the Asia-Pacific region that includes East Asia, South Asia, Southeast Asia, and the Oceania.

2. Background

Oceans offer numerous resources to humanity as seen in **Figure 1.** The oceans of the Asia-Pacific in particular have a diverse biological and productive marine ecosystem that is home to 17 of the 36 global biodiversity hotspots and 7 of the world's 17 mega-diverse countries. The region has the longest and most diverse coral reef systems, more than half of the world's remaining mangrove areas, and the highest seagrass diversity (UNESCAP, 2018). This vast biodiversity provides food to the local population and is a source of income due to seafood exports that account for nearly 90 per cent of the world seafood requirement (SEAFDEC, 2019). This has encouraged overfishing, unabated pollution, and destruction of marine habitat duly supported by inadequate governance. As a consequence, the region has experienced serious loss of marine biodiversity and ecosystem. Studies indicate that if no action is taken, the Asia-Pacific will lose 90 per cent of

the coral reefs by 2052 and all commercially exploitable wild fish stocks by 2048 (ADB, 2018).

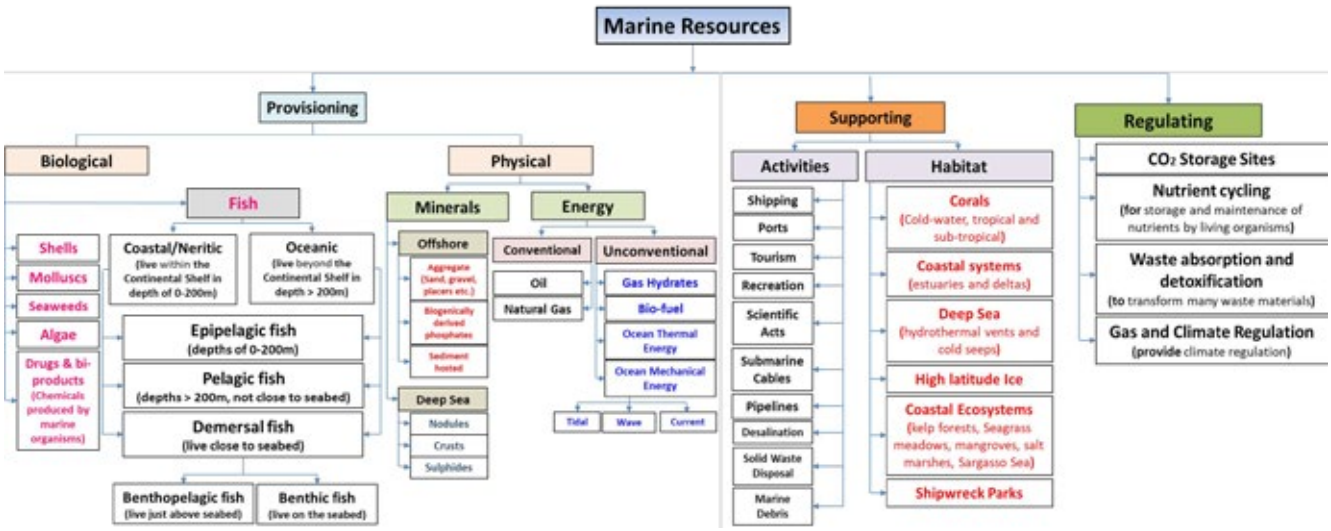

Figure 1: Taxonomy of marine resources (Source: Agarwala, 2020a)

While the concept of sustainable oceans took centre stage only in 1992 as part of the outcome document of the United Nations Conference on Environment and Development as Agenda 21 (UNDESA, 1992), that for terrestrial resources was known as early as 1987 as part of the Brundtland Report (WCED, 1987). Once introduced in 1992, sustainable ocean development became the universal principle of development that hinged on three pillars – environmental protection, economic growth, and social fairness.

Accordingly, ocean-related human activities and their impact on the oceans was studied as a multidisciplinary study area and evaluated to prioritise the sustainable use and conservation of the ocean resources. Such studies were aimed to help policy-makers, industries, businesses, and individuals to appreciate their role towards a sustainable ocean and to avoid confusion, contradictory actions, and failure to meet the said goals.

Since it is believed that the loss of the ocean biodiversity and ecosystem is eminent in the long run (Millennium Ecosystem Assessment, 2005) the United Nations declared 2021 to 2036 as a 'Decade of Ocean Science for Sustainable Development' (OceanDecade, 2019) to help nations achieve the 2030 Agenda for Sustainable Development.

3. Risks for Ocean Sustainability

As discussed, the ocean is responsible for numerous critical activities to ensure the well-being of humans. In order for the ocean to ensure this, like any other event in nature, it maintains a natural cycle that is sustainable as seen in **Figure 2.** However, this natural cycle has been impacted negatively by the anthropogenic activities. Since this sustainable cycle helps achieve productivity and a healthy and blue ocean, it is essential to understand the risks that are threatening this sustainability cycle and causing ocean degradation leading to an impact on ocean productivity and health.

3.1 Climate change

Climate change as a result of increased greenhouse gas (GHG) emissions is one of the most critical issues affecting ocean health and sustainability. While it has been amply proved that the climate changes being observed are due to anthropogenic reasons (Agarwala and Polinov, 2021), the resulting impact on different communities around the world is found to be different. Though the Asia-Pacific contributes little to the GHG emissions, the region is at maximum risk of unpredictable weather patterns such as an increase of summer temperature by 6°C by 2100 (ADB, 2017) that can result in failing crops, spiking food prices, and spreading diseases. This would make countries like Indonesia, Thailand, and Vietnam drier and the increasing sea-level as a result of melting of the polar ice would submerge much of Maldives and 18 per cent of Bangladesh will get inundated (World Bank, 2010). Such disasters will disallow socio-economic development of the region and hinder sustainable development in the Asia-Pacific.

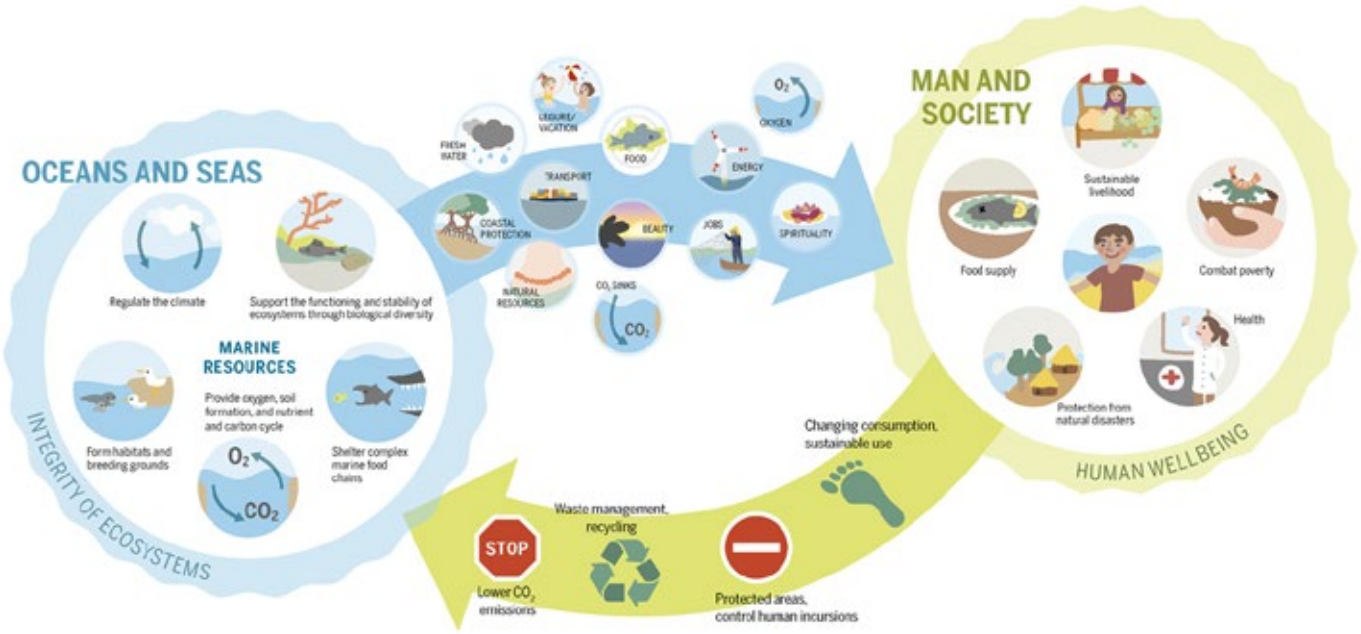

Figure 2: Circle of Sustainability (Source: Modified from Ocean Atlas, Visbeck et al., 2017)

3.2 Unsustainable resource extraction

Studies show that resource extraction has increased by more than three times since 1970. This has resulted in a biodiversity loss, water stress and an increase in the GHG emissions with the extraction and processing industry contributing to half of the total GHG emissions (UNEP, 2019). Similarly, events such as overfishing have depleted fish stocks to an extent that nearly 64 per cent of fish resource in the Asia Pacific, especially in Cambodia and the Philippines, is at a medium to high risk from overfishing. This eventually may lead to the collapse of the fisheries industry in this region due to harvest reduction by nearly 50 per cent (DeRidder and Nindang, 2018).

3.3 Land-based pollution

With an increase of the world population, waste generated on land is increasing. However, since what happens on the land has a direct or an indirect impact on the oceans, the waste generated on land eventually finds its way to the ocean through landfills, water bodies, wind dispersal or direct disposal. In countries with

a weak legal and institutional framework to check waste disposal and recycling, this problem is more prevalent and of concern. It is no wonder that the Asia-Pacific accounts for nearly 80 per cent of all marine pollution with the major portion coming from municipal, industrial, agricultural wastes and run-off. Studies indicate that each year nearly 8 million tons of plastic waste is dumped into the oceans with China, Indonesia, Philippines, Sri Lanka, Egypt, South Africa, Nigeria, Morocco, Thailand, Malaysia, Vietnam, Algeria, Turkey, India, Brazil, Pakistan, North Korea, United States, Myanmar, and Bangladesh, being responsible for 83 per cent of global plastic waste mismanagement (Jambeck et al., 2015). Since the rate of degradation of such solid waste especially plastics in the ocean is low, it has resulted in a gradual increase in marine litter both in and under the sea, which in return is impacting the human health and the marine ecosystem and hence the proper function of the sustainability cycle of the oceans.

3.4 Marine habitat degradation

Estuaries, swamps, marshes, and wetlands are ocean spaces that provide habitat for numerous marine species. These ecosystems are highly effective in carbon dioxide sequestering with mangroves absorbing around 30 million tonnes of carbon a year (National Academies of Science, 2019), salt marshes as much as 80 million tonnes and seagrass around 100 million tonnes (Pearce, 2019). In addition, they protect the coastline from storms and erosion and help buffer the impacts of sea-level rise.

However, with increasing anthropogenic activities such as dredging, filling, pollution, construction, oil spills and tourism activities to name a few, and natural events such as hurricanes, typhoons, storm surges and tsunamis in these oceanic spaces, the existing habitats of inshore coral reefs and coastal mangrove forests, seagrass, birds, and fishes (National Geographic, 2010) that are otherwise considered essential for maintaining the health of the marine ecosystem are being destroyed. In addition, rising sea-level as a result of climate change and coastal erosion is causing an irreparable marine habitat loss. Studies indicate that nearly 340,000 to 980,000 hectares of coastal wetland ecosystems are being

lost annually (The Blue Carbon Initiative, n.d), majorly due to localised human activities, sea-level rise, warming, and extreme climate events (IPCC, 2019).

In the Asia-Pacific this habitat degradation has a great significance for the Small Island Developing States that include twenty states in the Pacific and nine in the Africa, Indian Ocean, Mediterranean and South China Sea (AIMS) as they are the only source of food and revenue for these nations.

3.5 Ocean Acidification

Carbon is the main ingredient of all life on Earth. It is an essential element to form proteins and DNA. It is a key ingredient in food, essential for the plants to generate their food, a major source of energy, an essential element to regulate the temperature of the planet and many more. This carbon is recycled in nature between the atmosphere and the Earth through a natural cycle called 'carbon cycle'. On Earth, this carbon is stored in rocks, the ocean, plants, soil, and organisms with the excess carbon removed and stored as fossil fuels that act as reservoirs. However, this carbon is not static but flows naturally between these reservoirs. Similarly, since the atmosphere and the Earth form one system, there is an exchange of carbon between them too. The plants exchange it through photosynthesis and the water bodies through molecular diffusion and life-forms such as planktons and algae.

After the Industrial Revolution, anthropogenic activities to remove this carbon from the reservoirs and adding it to the atmosphere increased many folds with the use of coal and fossil fuel. This increased the carbon in the Earth's atmosphere and hence the demand on water bodies to absorb the extra carbon dioxide. This increased absorption of carbon dioxide by the oceans is resulting in a decreased pH of the water making it acidic. This in return reduces the carbonate in seawater which is considered essential for marine organisms to form their shells and skeletons forcing the existing corals and shells in the oceans to dissolve eventually resulting in the reduction of the sea food available to humanity. Hence, ocean acidification is a serious risk to ocean health and needs to be addressed.

4. Challenges to achieve Ocean Sustainability

Though achieving ocean sustainability is an accepted commitment by nations as an outcome of the UN SDG-2030, achieving it has numerous challenges. These vary from lack of funding to at times lack of intent. These notwithstanding, sustainable oceans are a must for the existence of future generations on Earth. It is hence essential that these challenges are understood so as to better address them. Some challenges that plague ocean sustainability include:

4.1 Economics

Sustainable ocean economy came into prominence because of the Small Island Developing States (SIDS), who were concerned about the well-being of ocean health as their own existence and survival depended entirely on the oceans. These nations are economically weak and unable to implement new technologies and policies. While the need is urgent, lack of available funds is an impediment to implement sustainable use of ocean resources by these nations. For the larger nations while ocean sustainability is important, it is not critical as they have terrestrial resources for their growth and hence the intent of investing towards ways and means of achieving ocean sustainability is limited.

4.2 Policy making

Ocean based economic activities and the resulting deterioration of the marine environment and ecosystem has increased pressure on governance and hence policy making. Accordingly, various world organisations run programmes to address issues that will help better policy making. While the UN Environment addresses management and pollution related issues,[1] FAO addresses those of fisheries[2] through Port State Measures Agreement to eradicate IUU fishing and the IOC handles development of scientific solutions.[3]

Since a business-as-usual model in the ocean is no more acceptable, it needs to be avoided. This puts enormous pressure on coastal states who need to

1 See, https://www.unenvironment.org/ accessed on 10 November 2021

2 See, http://www.fao.org/fisheries/en/ accessed on 10 November 2021

3 See, https://en.unesco.org/ocean-decade accessed on 10 November 2021

introduce and implement policies to encourage sustainability, thereby increasing the cost of operations and governance, a difficult path especially for the SIDS which are otherwise poor nations and have only the ocean resources for their food and economy to depend upon. Additionally, since the adoption of disruptive technology in the maritime industries is a slow process (Agarwala, 2021a), putting the requisite policies in place and ensuring compliance is even slower, difficult and sometimes ineffective.

4.3 Technology

With a basic understanding that technology can address and resolve human problems, a number of fixed, submerged, remote, autonomous and drifting systems have been developed. These systems acquire, process and transfer large volumes of ocean data to provide a better understanding of the ocean and to support a safe, effective and sustainable use of ocean resources and to monitor the risks towards ocean sustainability.

While many technologies have been developed we still know little about the numerous marine species and topography in waters greater than 3,000 metres. Furthermore, humanity lacks a detailed scientific understanding of the role of oceans in climate change and their influence on weather that are considered essential to manage ocean ecosystems and sustainable operations of ocean-based industries.

4.4 Voluntary commitments of developing and poor nations

It is important to understand that even though globally the general principle of growth and development has been to 'develop first and clean-up later' (Agarwala, 2021b), this principle cannot be employed by the developing and poor nations. This is primarily because Mother Nature has run out of resilience and cannot absorb anthropogenic abuse any further. Hence, if growth and development is to be achieved by these nations, they need to follow the path of sustainability, thereby making their growth process expensive and sometimes difficult to achieve. This is forcing developing and poor nations to either not commit to emission targets or commit to lower values. A point in case is the INDCs of most nations that

provide the commitments of reduced carbon emissions while ensuring growth and prosperity of their citizens. Though these INDCs have been made voluntarily by the nations, they are either not being achieved or are grossly inadequate to meet the commitments of the Paris Agreement (Agarwala and Polinov, 2021).

Though the situation may look grim, it is not that nothing has been achieved to date. Studies have shown that though the world was on a 3.6°C track in 2015, concerted efforts by nations have put it on a 2.9°C path by 2020 (CAT, 2020). However, this is far from the desired path of 2°C to 1.5°C path as committed by nations during the Paris Agreement. Even today, 37 per cent of the 127 countries do not have a net-zero target and only 48 countries have submitted new INDC targets.

4.5 Understanding the requirement to achieve sustainability

The available literature on Blue Economy and Sustainability has increased many folds in recent years that make it even more complicated for one to appreciate as to what needs to be done. This said, it is, however, not clear as to how this sustainable ocean economy, generally addressed as the Blue Economy, should look like (Patil et al., 2016). The need for a definition, policy and the path required for its development, therefore, has become critical as there looms a large risk if the ocean-based activities are undertaken without this clarity. The problem becomes even more acute as, according to the Organisation for Economic Co-operation and Development (OECD), many ocean-based industries have the potential to outperform the growth of the global economy as a whole, thereby boosting employment and doubling the economic contribution to GDP equivalent from the ocean economy in the next fifteen years through 2030 (OECD, 2016). It is because of this that, in recent years, there is a consistent focus of humanity to develop this economy.

It thus becomes important that one understands as a basic minimum as to what is required to ensure a sustainable ocean development. In the understanding of the author, the following are essential and need to be focused on to achieve sustainable ocean development:

(a) Protecting and restoring coral reefs.

(b) Develop restorative aquaculture.

(c) Invest in nature based solutions to climate change.

(d) Invest in sustainable methods for exploiting ocean resources.

(e) Develop technology to support marine protected areas.

(f) Develop technology to monitor and fight marine pollution.

5. Opportunities to achieve Ocean Sustainability

Having discussed the risks and challenges in achieving ocean sustainability we need to look at the opportunities that can encourage steps towards a sustainable ocean economy. While we look at the existing opportunities we need to encourage innovation networks of research institutes, enterprises, and universities to work together on a range of scientific and technological innovations to achieve a sustainable ocean economy. This would however be possible only if adequate capacity is created to develop and provide affordable, ethical and socially acceptable innovation and technologies that are environmentally sustainable and are capable of delivering solutions to even the most marginalised communities and income groups. Some available opportunities that exist and under development are:

5.1 Use of digitalisation for pollution control

Anthropogenic efforts post the First Industrial Revolution has been greatly responsible for initiating the human woes with respect to environmental pollution. However, the Fourth Industrial Revolution or the Digital Revolution through the use of Artificial Intelligence (AI) is creating a societal shift to address this environmental deterioration that is threatening future life on Earth even though numerous challenges, such as high cost and the need for regulatory approvals, act as barriers to their effective use. By using AI along with Machine learning (ML) and Deep Learning (DL) the complex process of the environment can be understood and sustainable trends of resource utilised. This, in turn, would help nations to achieve the SDG-14 goal of conserving and using ocean resources sustainably (UN, 2015). In order to ensure sustainability and a healthy ocean, issues of pollution, habitat, species, climate change impact, and biodiversity, as seen in **Figure. 3**, need to be addressed, which can be and are being done extensively through the use of AI (Agarwala, 2021c).

Similarly, digital platform technologies (blockchain, IoT, cloud data, and big data analytics) are helping towards better administration, logistics, shipping, terminal, and port working. This in return is helping in decarbonising of the shipping industry (Agarwala et al., 2021) and encouraging saving energy, fuel in transport, and limiting pollution (Agarwala and Guduru, 2021).

Figure 3: Utilising AI for ensuring a healthy ocean (Source: Agarwala, 2021c)

5.2 Use of technology for understanding the Ocean

Technological advancements are impacting every aspect of ocean economy so much so that the next Industrial Revolution is likely to be driven by Digital Revolution which is referred to as Industry 4.0. These innovations are happening in numerous fields such as advanced materials, subsea engineering and technology, sensors and imaging, satellite technologies, computerisation and Big Data analytics, autonomous systems, biotechnology, and nanotechnology. Since these technologies are cross-cutting and not area specific, they are likely to impact every facet of ocean economy.

To understand the ocean better, dedicated ocean observation procedures and technologies have been employed over the years (Agarwala, 2020b). The data collected in some cases is free and open that allows multi-stakeholder contributions thereby creating better opportunities for the scientific community

at large. Such efforts can help forecast sea conditions, improve marine safety and support ocean-based business activities such as shipping, aquaculture, fisheries, algae blooms, port navigation, disaster management and protection of species by altering shipping lanes, to name a few. Yet another form of dynamic observatories for marine scientific research being proposed is through the use of "green cables" (Agarwala, 2018; Agarwala, 2019).

5.3 Use of ocean energy to power a sustainable ocean economy

Energy in general is considered essential to support the growth of shipping, fisheries and ports and the high-growth industries of marine aquaculture, ocean observing, marine robotics, biofuels and mineral extraction. Since the coastal real-estate is at a premium, the energy sector has moved inshore to avoid conflict with other users. This in return has made energy for ocean economy activities costly, forcing energy generation on site in the marine environment using ocean energy. Accordingly, a number of ocean energy technologies have been developed over the years. These include processes of kinetic energy (winds and currents), potential energy (tidal amplitude), mechanical energy (waves), thermal potential (vertical temperature gradients) or even osmotic pressure (horizontal gradients of salinity) (Agarwala, 2021d).

However most of these technologies are still under development with many economic, technical, governance and environmental problems to be solved (Melikoglu, 2018). While technologies, like wind, are maturing and have already achieved commercial success, technologies such as Ocean thermal energy conversion (OTEC) promise both freshwater and electricity and hence can be used for dual purposes. For ecologically fragile regions and small islands, a Low-Temperature Thermal Desalination (LTTD) combined with the OTEC can be used by the SIDS of the Indo-Pacific region (Maitreyee and Agarwala, 2019).

As humanity tries to harness the ocean-energy, a variety of methods have been experimented with for each of these sources, but so far cost, performance and/or reliability benefits have not been demonstrated. Furthermore, since waves and currents are influenced by the shape of the ocean floor, each site needs to be studied independently and exploited accordingly. As the industry matures, a

convergence of a number of technologies is expected, similar to what was seen by the terrestrial wind-energy industry.

5.4 Committing funds from recovery

It is an accepted fact that the nations of the world have a disparity in their economic status. This disparity has disallowed developing and poor nations to commit funds towards recovery from the impact of climate changes. Even though some sectors believe that developed nations should step forward to financially support this recovery process since the carbon emissions of today is because of these nations. However, there is little acceptance of this thought and lack of funds is the usually cited reason. This explanation notwithstanding, the recent events of COVID-19 which brought the global scientific community and funding together is proof enough that if the global community decides to address an issue, they will be able to do so provided it is supported by a political will.

In the initial months of COVID (01 January to 24 May 2020), various funding agencies of the global community pledged nearly US$ 14.0 trillion alone to fight COVID-19 and to revive their economies (Cornis, 2020). Of these, the EU alone has gone ahead to proceed the 'green' way when moving towards an economic recovery (Rowlatt, 2020). If only the world was to consider a mere one per cent of such committed funding for development of technology to address climate change and towards sustainability, it would deliver amazing results.

5.5 Invest in sustainable methods to address IUU fishing

Technological solutions exist for curbing *IUU fishing*. These solutions vary from vessel tracking to law enforcement using mobile technology (USAID, n.d) or dedicated transmitters (USAID, 2018). It is worth mentioning that nations tend to comply, make changes and deliver under international pressure. A case in point is the successful efforts of Thailand to curb IUU fishing after they were warned by the EU in 2015. To address this issue Thailand used modern day technology to develop a robust and reliable system.

Accordingly, all fishing vessels above 30 GT were installed with Vessel Monitoring System (VMS) and the fishing gear verified with a fishing licence. After 01 April 2018, vessels caught without a valid licence were prosecuted. This resulted in locking

up of 1,098 commercial fishing vessels (Starn, 2018). Additionally, illegal vessels were purchased by the government and all new registrations were suspended for two years starting July 2018. Destructive fishing methods were prohibited and the validity of their licence was redefined to encourage sustainable fishing. To support law enforcement, monitoring, control and surveillance (MCS) was improved and aircraft and unmanned aerial vehicles were used to support sea patrols (MFA, 2018). All fish catches were recorded electronically (EJF, 2019) and prosecution was adequately supported by strengthening local laws.

This effectively means that mechanisms to stop IUU fishing and shift to sustainable methods exist and can be applied if the nation involved is forced to do so. Since IUU fishing is one risk for the sustainability cycle, it needs to be stopped immediately to ensure a sustainable ocean economy.

5.6 Eco engineering

Eco-engineering schemes refer to the modification of planned or existing structures to become multifunctional. By installing artificial floating islands (AFIs) a habitat for biodiversity can be created. The AFIs are typically two square metres that broadly consist of a buoyant mat of non-woven plastic matrix, integrated connection grid and polyurethane foam, planting media and emergent vegetation. They are a novel technique that has been employed in the UK (Ware and Callaway, 2019).

5.7 Geo engineering

Geo-engineering is an engineering process wherein CO2 from the air is removed to tackle climate change. Limiting sunlight reaching the planet is yet another process that geo-engineering employs to tackle the impact of climate change. Although large-scale geo-engineering systems are still a concept, they are presently treated as a distraction for reducing emissions. It may become a reality if climate change continues (--, 2011). They are considered as the last resort since even after Paris Agreement the world nations have not been able to limit the rise of temperature to below 2°C and it is felt that as a last resort such geo-engineering efforts would necessarily be required. However, some researchers feel that utilising such methods would give a free hand to economies to pollute without any control. The five carbon capture technologies that are being explored

include Direct Air Capture (DAC), Bioenergy with carbon capture and storage (BECCS), Biochar, Enhanced Weathering and Trees and Soil (Collin, 2020). While the IPCC estimates that BECCS could potentially remove around 10 billion tonnes of CO2 from the atmosphere each year (Jacobson, 2019), 'the Orca' carbon-capture plant, outside Reykjavik in Iceland, using the DAC technology has been switched on in September 2021 to remove 4,000 tonnes (approximately 4,409 tons) of carbon dioxide every year that is equivalent to emission from 870-cars (France-Presse, 2021).

5.7 Marine biotechnology

Advances in science and technology in molecular biology have supported the development of *marine biotechnology*. These studies have helped to improve our understanding about the marine life. It has also provided access to marine organisms, ecosystems, and bio-resources and allowed their study which so far has been lacking (OECD, 2013). This technology has application in sectors of energy, pharmaceuticals, food, and chemical industries. The technology aims to significantly increase production efficiency and product quality in sectors by introducing new species for intensive cultivation thereby encouraging sustainability through better understanding.

6. Way Ahead

As discussed in the preceding sections, the ocean resources are under serious stress from human activities and hence there is a serious and urgent need to ensure sustainable ocean development. Accordingly, the known risks, challenges and opportunities have been discussed. It is felt that there is an urgent need to build capacity; provide access to affordable innovation and technologies; and ensure research and innovation that are ethically and socially acceptable, environmentally sustainable, and that can be utilised by the poorest and most marginalised communities and income groups. It is only once such solutions are available that ocean assets will be protected, restored, and enhanced. While some broad based opportunities have been discussed, to achieve ocean sustainability, the following are considered essential.

(a) *Regional cooperation*, to address the complex and trans-boundary nature of ocean and coastal issues and challenges.

(b) *Best practices* of ecosystem-based management to be utilised proactively to protect and sustain marine and coastal ecosystems and their functions.

(c) *Integrating fisheries and marine resources* as part of food security would provide a better understanding of the link between fisheries, food security and food safety thereby promoting healthier practices in fisheries management; combating IUU fishing; and sustainable mariculture practices.

(d) *Knowledge dissemination* about the role of coastal and marine ecosystems needs to be encouraged for greater public awareness of the benefits these ecosystems provide during natural disasters.

7. Conclusion

Sustainability of oceans for a prosperous future of humanity is an essentiality. Even though oceans have sustained the requirements of mankind to date, unsustainable means have brought the oceans to a point where they can no more support the excesses of humans. It is in response to this understanding the United Nations adopted the Sustainable Development Goals 2030, Goal 14, while various international organisations have begun focusing on encouraging sustainable ocean economy.

To better appreciate the risks, challenges and opportunities available towards a sustainable ocean economy and encourage greater public participation, the article has discussed these aspects. It is important to appreciate that ocean sustainability cannot be achieved by technology and innovation alone, as they are only facilitators. The need of the hour is political will and human participation that can help strengthen the policy and regulatory frameworks; sharing knowledge on lessons learned and support regional cooperation on trans-boundary issues.

Disclaimer

The views expressed in the paper are those of the author and do not reflect the views or policies of the Government of India or the Indian Navy. The author can be reached at nitindu@yahoo.com.

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Section II

STUDIES OF SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT

Enriching Lives through Sustainable Agriculture the '*wadi*' way – A case of Nagaland state

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Introduction:

Ever since the United Nations Conference on Environment and Development in Rio in 1992, sustainable development has been at the centre of policy-making for governments around the world. With the emergence of new policies, a broad consensus has been reached for the promotion of sustainable agriculture practices to achieve the target of Sustainable Development Goal 2: Zero Hunger by 2030. By definition, Sustainable agriculture is farming in sustainable ways meeting society's present food and textile needs, without compromising the ability of current or future generations to meet their needs. Implementation of resilient agricultural practices that increase productivity and production without disturbing the natural ecosystems has been the prime focus of this idea.

Indian agriculture has been predominantly rainfed covering 60% of the country's net sown area and accounts for 40% of the total food production, which makes it important for us to conserve natural resources to meet the burgeoning demands for food grain in the country. In this context, the Government of India has formulated a National Mission for Sustainable Agriculture (NMSA) in 2014-15 for enhancing agricultural productivity, especially in rainfed areas with a special focus on integrated farming, water use efficiency, soil health management and synergizing resource conservation. A Sustainable agriculture mission is also among one of the eight Missions outlined under the National Action Plan on Climate Change (NAPCC). NMSA architecture has been designed by consolidating and

subsuming all ongoing as well as newly proposed activities/programmes related to sustainable agriculture, and to infuse the judicious utilization of resources of commons through a community-based approach.

The Wadi Model:

National Bank for Agriculture and Rural Development (NABARD) has been playing a pivotal role in promoting sustainable agricultural practices in the hinterlands of our country. In particular, those inhabited by tribal communities are dependent mainly on agriculture, forests and livestock for their livelihood. Many of these communities reside in inaccessible areas still devoid of infrastructure facilities which deprive them of having access to technological and financial facilities being provided by the Government. While NABARD has been supporting tribal development through refinance, special lines of credit to agencies supporting tribal families, promotional activities, etc, a key concern has been the sustainability of tribal livelihoods. NABARD gained rich experience in this regard through the implementation of the German KfW (Kreditanstalt fr Wiederaufbau) assisted Adivasi Development Programmes (ADPs) in Gujarat and Maharashtra. This model of tribal development encompassed natural resource management in rainfed tribal areas, micro-finance initiatives and women empowerment through people's participation. However, as the ADPs covered only two states supporting only a minuscule of the tribal population of the country, it was felt that the creation of such 'wadi' models in the rest of the country would act as development catalysts helping to transform tribal lives on a large scale. NABARD, therefore, took the initiative of creating a Tribal Development Fund (TDF) with an initial corpus of ₹ 50 crores, from out of its profits during the years 2003-04. The fund is being used for replicating the ambitious 'Wadi model' across the country for the integrated development of tribal families on a participatory basis through the adoption of sustainable income generating activities based on the potential of the area and the tribal needs. Wadi in Gujarati means an orchard. Wadi (small orchard) concept was introduced in 1982 in Vansda, Navsari District in South Gujarat by BAIF (Bharatiya Agro Industries Foundation), Pune as a Comprehensive Tribal Development Programme for sustainable livelihood.

Pioneered by BAIF and consciously supported by NABARD, the central focus of the model comprises of a Wadi plot usually of one acre per beneficiary who must be a marginal farmer having less than 5 acres of land. Two or more crops are strategically selected for intercropping in the Wadi model, which minimises climatic, biological and marketing risks. In each acre of such cultivation, around 100 fruit trees of guava, gooseberry (amla), mangoes, litchis or other varieties appropriate to the region are planted. The space between the fruit trees is used for growing seasonal crops and the periphery is bio-fenced with forestry, fuel or timber species. Water resources used for orchards are created as common assets to be shared by groups of wadi owners which leads to improved water efficiency and promotes sustainability. Organic practices improve the soil organic content and nutrient recycling, this, coupled with the soil conservation measures along with the root network of the trees, leads to reduced runoff and soil erosion. This multi-tiered cropping pattern presents a sustainable solution for marginal farmers to be profitable even on small plots of land. With the diversification of agriculture and horticulture products, farmers are ensured of a regular flow of income and nutritional security throughout the year. The wadi model also helps in mitigating climate change by conversion of atmospheric carbon into tree biomass and soil carbon that act as long-term carbon sinks. It further helps to reverse the ecological degradation caused due to shifting cultivation practised by tribal farmers thereby improving soil conditions in harmony with nature which regenerates the production potential of the land.

Further, women's self-help groups (SHGs) are also formed under the model as a platform for encouraging their socio-economic empowerment through the promotion of savings, facilitation of bank linkages and micro-credit for initiating income generation activities. Training and capacity building for livelihood diversification through the farm and off-farm income generation activities are also conducted for the farmers and the SHG members. The training platforms are also used to generate awareness among the households on aspects of social development including health, education and sanitation for a more holistic development.

The principles on which TDF projects are designed are, need based and location specific, relying on community ownership and community contribution through

family labour, transparency in decision making and fund management, addressing gender issues and intensive capacity building measures with the seasonality of activities. The projects are implemented through NGOs, Community Based Organisations (CBO), Trusts, and Corporates directly or through their CSR wings. Under TDF, NABARD provides grant assistance per family per acre of ₹67000 in plain areas and ₹72000 in Hilly/North-eastern region (NER) areas respectively. Since its inception, NABARD has supported 778 wadi projects across 282 districts with grant support of ₹ 2112.23 crores covering an area of approximately 5 lakh acres, being benefitting more than 5.3 lakh households. The north-eastern states of the country, which are predominantly tribal by population have benefitted immensely from this initiative of NABARD, being implemented through its Regional Office at the state capitals. In the state of Nagaland in particular the NABARD Regional Office has been working closely with several Community Based Organisations at the grassroots to support tribal farmers in adapting the Wadi model. A total of fourteen such projects have been developed under this initiative over the last twelve years with a financial grant support of ₹23.14 crore benefitting close to 5350 tribal households. One of the visible outcomes of the wadi projects in the state has been the gradual shift from the traditional form of shifting cultivation, to a more sustainable form of farming.

Projects:

A TDF project successfully grounded through the Chakesang Women Welfare Society (CWWS) as the project implementing agency (PIA) in 8 villages of Phek District, has been successful in providing livelihood to 500 tribal households, where more than 500 acres of land has been brought under the wadi model. Intercropping of seasonal crops like maize with various horticulture crops has increased the productivity of the land. The upland has been developed into an orchard of Kiwi and Orange plantations. The lands have been developed through adequate land development measures and critical irrigation facilities to provide maximum return to the families in a sustainable manner. Planting of tree tomato and banana have been undertaken along with the alder tree and tree bean as border plants. This coupled with good -yielding varieties of king chilli and ginger ensures a regular flow of income throughout the year for farmers. The highest income earning household from the project earns around ₹ 2 lakh per annum.

Around 8 water resource projects have been created as a part of the project which ensures the availability of water for the farmers in a sustainable way. Further, awareness building and conducting of health camps to promote healthy and clean lifestyles among the tribal households with a focus on the menstrual health of women have been some of the social goals of the project which were achieved under the project. A total of fifty-two women SHGs were formed and linked to banks, which is helping to bring women in the villages under one umbrella to address social issues and also to create awareness about various government programmes and services available to them. Overall, the project helped in shifting the villagers from a subsistence form of farming to a commercial one with a focus on sustainability.

An ongoing wadi project under TDF being implemented by the Eleutheros Christian Society (ECS) an NGO in Tuensang District, aims at improving and enhancing sustainable livelihoods of the targeted farmers using the wadi model through the development of kiwi fruit orchards integrated with cardamom. After successfully implementing 2 two wadi projects sanctioned to it in the years 2008-

09 and 2010-11 where 875 tribal households were assisted, this is the third wadi project sanctioned to the ECS for implementation. The project area has kiwi tree vines and shade-loving cardamom crops with seasonal vegetables such as maize, cabbage and potatoes intercropped into the wadi for the initial years to maximise the returns to the farmers. A total of 200 farmers from two villages have been selected, trained and supported to adapt this form of farming. The local district Krishi Vigyan Kendra (KVK) has been roped in as the main resource facility for conducting training and providing technical inputs for proper management of the wadis. Cherry trees and other local flowering tree species have been introduced as border plants to assist in the pollination of the kiwi plants and also serve as wind breaks thereby protecting the fruit crops. Some of the measurable outcomes of the ongoing project include; i) good returns from the seasonal crops interplanted in the wadi where sale proceeds crossed ₹ 40.00 lakh during the year; ii) the farmers were mobilised to form a Farmer Producer Organisation; iii) an increase in family income of the farmers due to crop diversification and increase in family nutrition as a result of more crop varieties being produced; iv) farmers can now see better remunerative options for themselves and look beyond traditional farming which was solely for own consumption; v) the village women have played a major role in contributing to the family income. 19 Women SHGs in the project area have been actively involved in wadi development related activities as well as other income generating activities.

Beneficiaries:

Vechota Nyekha, is a beneficiary among thousands of others under NABARD's Tribal Development Project in Nagaland. He belongs to a small hamlet called Chesezu in Phek District of Nagaland where a majority of farmers grow oranges in their farms. However, with support under TDF, he can benefit from various other crops and vegetables that are cultivated in the orange farm he owns. He had planted maize, banana, pineapple, ginger, brinjal and other vegetables as intercrops under the project. He gets an additional income of ₹20,000 to ₹35,000 annually which in fact is a huge amount for a farmer in the village. His family is able to make a sale of ₹50,000 annually from banana alone. He says "Tribal Development project has taught me many things. I have learnt how to cultivate fruits in a more appropriately

and systematically. I have also learnt the importance of inter-cropping, and how to make more income from small and seasonal vegetables and crops. Family income has increased considerably and I am excitedly waiting for the time the oranges will be ready for production". He is grateful to NABARD for implementing the project through the Chakhesang Women Welfare Society in his village and for selecting him as one of the beneficiaries.

In another such project, Theri Sangtam, a young graduate who was looking for work and planning to migrate to Bangalore for greener pasture has now become an active volunteer helping with the implementation of the project in his own village. Persuaded by Better Life Foundation (BLF), a PIA under NABARD's TDF programme, he took up farming as a full-time occupation and became the pioneer in Kiwi farming in his village. Following his example many farmers have taken up Kiwi plantation. Last year he had two Tons of Kiwi produced in his wadi selling at a farm gate price of ₹ 150-200/kg. In addition to kiwi, he has planted cardamom that has been giving high yields and holds the record for the maximum cardamom produced in an acre in the block with a total dry cardamom production of 350kg/Acre.

The success of sustainable integrated farming practice has helped many and inspired others across the remotest villages of Nagaland to shift to a more sustainable approach to farming. NABARD Nagaland in collaboration with its partner NGOs is working at the grassroots level to implement innovative methods of sustainable farming.

Way forward:

When agricultural operations are sustainably managed, they can preserve and restore critical habitats, help protect watersheds, and improve soil health and water quality. The need for sustainable resource management is increasingly urgent, as demand for agricultural commodities is rising rapidly with the rising world population. Agriculture's deep connections to the world economy, human societies and biodiversity make it one of the most important frontiers for conservation around the globe and Agriculture being highly climate sensitive makes the small land holder farmers the first victims as they have low adaptive capacity. In this context, Adaptive Sustainable Agriculture is the way forward that the world is looking at and NABARD being an apex development institute for rural India has been working as a frontrunner in promoting it. Further, with renewed policies and combined efforts of all the stakeholders including both public and private sectors, the journey to sustainable food security can be achieved with ease in the future.

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Kerala's Journey Towards Sustainability: The Challenges Ahead

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Introduction

The modern environmental movement completed five decades in 2020. During this half a century period with various advancement of science and technology and socio-economic changes, society gained significant insights into the increasing human footprints on the Earth's biophysical system, and also notable progress has been made in addressing some of the acute environmental problems, however, the natural systems continue to deteriorate unabated (Tortell, 2020). Scientific evidence amply demonstrates growing human perturbations of the earth system and consequent stress on social and economic systems. So intense, penetrative and impactful are the human interventions in the earth's ecosystem that a new term 'Anthropocene' was coined to designate the current geological epoch since industrial revolution (Crutzen and Stoermer, 2000). Changing earth system processes are evident both at the planetary scale and also at the local scale. The human-induced changes affect the self-regulating functions of the local ecosystems and through aggregation may impact boundary conditions of regional and planetary earth system processes as has been noted at the global level (Rockstrom et al, 2009). It is now well demonstrated that planetary and social imbalances reinforce each other (UNDP, 2020). The environmental risks are increasing so is the case with socioeconomic inequality. That climate change will further aggravate social and ecological stress is well documented through IPCC

reports and 26 COPs so far taken place expressing global concern about this issue. Considering the magnitude of earth system change and its overwhelming impact it is suggested that the Human Development Index (HDI) may be adjusted with planetary pressure (ibid, 2020).

The relationship between humans and nature is dialectic. The ecological and social systems are mutually reinforcing and co-evolving. Science can explore and help understand the functioning of the earth system processes, its resilience level, and how the social processes impact and tend to modify the functioning of natural systems and thereby interfere with the resilience level. However, it is the direct engagement of the larger society and the actors at the ground level that can help address the emergent problems as the accelerated environmental changes, whether local or global, are triggered through the aggregation of individual, community, and local actions. Examining the change in the earth system processes through the lens of social-ecological systems is, therefore, important in society's journey towards sustainability.

The state of Kerala is situated in the south-western region of the Indian Peninsula has drawn significant national and international acclaim for its achievements in the social sector and human development. It has been argued that Kerala's performance in the sectors of health, demography, and education has put the state on firm footing to strive for sustainable development and therefore warrants closer examination (Parayil, 1996; 2000; Chattopadhyay and Franke, 2006). In recent years, Kerala's performance in the face of incidence of the Nipah virus in 2017, flood disaster in consecutive years of 2018 and 2019, and unprecedented Pandemic of Covid-19 in 2020 and 2021 drew worldwide attention and commendation. It manifests Kerala's resilience to withstand emergency situations and move forward. The questions often raised in this context are: (i) how did Kerala acquire this resilience? (ii) what are the specific lessons to be learnt from these incidences?, (iii) can this resilience be capitalised on to attain sustainability?, and (iv) what are emerging challenges for Kerala in its journey towards sustainability? These questions assume greater significance in the face of climate change emergencies that are of planetary dimensions. This paper deliberates on some of these questions with a primary focus on earth system challenges. It notes changing perspectives of sustainable development and

highlights Kerala's performance under sustainable development goals. Further, the discussion covers Kerala's human development and people's plan campaign initiative as part of social resilience and brings out the spatial gap in social development. This is followed by a brief discussion on environmental change in Kerala and finally, a social-ecological framework has been proposed for resilience building and sustainability.

Sustainable Development: Changing Paradigm

Development is a contested term and hardly there is unanimity among the countries to define this term. Nevertheless, all countries strive to achieve development and adopt development policies to fulfil their goals. The path of development that a country proposes to follow and the appropriate strategy would depend on resource endowment, prevailing economic situation, people's aspiration, government policies, national views regarding the role of the State, and such other issues. Still, most of the countries, in spite of their position in the trajectory of development follow a development path that is near deterministic and comprises of economic growth (from agrarian economy towards the dominance of industries and then recently, service sectors), structures of governance (from autocratic regimes to democracy), socio-economic interrelationships and the patterns of consumption (from the local market to super market, from staple cereal to meat, etc.) (Bellu, 2011). This approach seems to be linear and tries to homogenise the society irrespective of their biophysical background, natural resource endowment and access to resources, historical legacy, cultural milieu, beliefs, and the political system. More often than not the site-specificity or uniqueness of an area is considered as noise and diversity/ plurality is viewed as disturbance or hindrance to development. It is now well realised that this model has not yielded desired results as is evident from growing inter and intra country inequality, class differentiation, widespread discontent among the citizens, increasing gap between resource-poor and a resource-rich group of countries, and looming ecological collapse and environmental degradation affecting most of the ecosystems with potential to retard the entire development process. It is thus necessary to revisit how the existing discourse on development has been conceived so far with reference to the ongoing development policies

and practices. There were deliberations on changing the course of development and stress was on internalisation of environmental and social concerns along with economic growth. The disintegration of the Soviet Union, opening up of the economy in the post-globalisation scenario, increasing thrust on the private sector and gradual withdrawal of the state from various development activities have raised serious questions about the course of development that is being followed.

The concern was first articulated during the Stockholm UN Conference on the Human Environment in 1972. Subsequently, the World Conference on Environment and Development (WECD, 1987) report published in 1987 highlighted the changing perception of development, the need for addressing environmental issues, and deliberated on sustainable development. The report attempted to define sustainable development 'as development that meets the needs of the present without compromising the ability of the future generations to meet their own needs' (WECD, 1987). It proposed considering ecologic, economic, and social dimensions within a single frame while formulating development activities. Following this conceptual change, there had been widespread use of the term sustainable development, and its corollary sustainability is now considered as a development goal. While there is little debate about its desirability, the approach to achieving this goal is contentious. Nevertheless, all countries under the UN system have committed to adopting sustainable development goals (SDGs). It has emerged as the urgent priority at the event of climate change, and its impact on societal sustainability. Since the publication of the first assessment report of the Intergovernmental Panel on Climate Change (IPCC) in 1990 and the first Conference of Parties (COP) held in Berlin in 1995, climate change has its roots in anthropogenic interventions and has emerged one of the vital issues of global deliberations. The Assessment Report 6 (AR6) of IPCC 2021 stressed limiting global temperature rise at 1.5oC level and strengthening the collective response to climate change menace, sustainable development, and poverty eradication. The need has been reiterated in the Conference of Parties (COP) 26 at Glasgow in 2021.

Resilience and Sustainability

Conceptually, resilience and sustainability are interdependent and desirable social goals (Adger, 2000; Derissen et al. 2011). While resilience indicates capacity to adopt or bounce back after a sudden change or shock, the sustainability focuses on resource conservation for present and future generations. It is often argued that resilience is the key strategy to achieving sustainability (Common, 1995). In a review article Marches et al (2018) examined similarities and differences between resilience and sustainability in the context of environmental resource management and observed that there are commonalities as the frameworks proposed for resilience and sustainability are purported to provide benefits to the people under normal and extreme operating conditions and to manage environment accordingly. The Paris Agreement on Climate Change (2015), Hyogo framework (2005-2015) for disaster reduction, and Sendai framework for disaster risk reduction (2015) stressed resilience and called for actions strengthening community's ability to respond to global change and withstand risks (UNSDR-WMO, 2011; Zhao, 2020). Building resilience is also part of sustainable development goals (SDG no 11 and 13). Increasing environmental threats, erosion of natural capital, and lack of people's ability to cope with natural vagaries and man-made disasters of social and economic consequences have brought resilience in the central focus of sustainability. Building social ecological resilience is now part of a road map to sustainability.

Sustainable Development Goals (SDGs) - a Transformative Initiative

Since the publication of the WCED report, there had been three world conferences specifically on sustainable development at Rio (the Earth Summit, 1992), at Johannesburg (the World Summit on Sustainable Development, 2002) and again at Rio (Rio + 20 UN Conference on Sustainable Development, 2012). The Millennium Development Goal (2000) also stressed the necessity of sustainable development and set up certain targets to be achieved by 2015. While there had been worldwide actions on attaining some of these goals many remained to be fulfilled. Besides, there are also newly emerging challenegs of growing urbanisation, and problems of human health. To address all these issues the UN General Assembly adopted the

Sustainable Development Goals (2015)- 'A blueprint to achieve better and more sustainable future for all people and the world by 2030'. Known as the Post 2015 development agenda this new initiative has identified 17 sustainable development goals (SDG) with specific targets by 2030 (UNDP, 2015). It succeeded the Millennium Development Goals with few new additions to incorporate emerging challenges. This reiteration on sustainable development and sustainability is significant both in terms of context and content. All SDGs are now have been brought together in 'one frame as an indivisible and universal whole and therefore not only the goals and targets but also the interactions among them are brought into focus' (Global Sustainable Development Report, 2019:1). The thrust is now on transformation which may be system-based, factually grounded, and scale dependent.

SDG Indices

Computation of SDG indices is a relatively new initiative introduced across the world to assess the performance of the countries and their constituent parts. The seventeen Sustainable Development Goals (SDG) cover all the key sectors of development like education, health, sanitation, employment, infrastructure, energy, and the environment with specific time-bound targets (Government of India, 2021a). The Government of India, following the UN initiatives, began the process of evidence-based measurement of state's performance since 2018. The present report (2021) referred to as SDG Index 3.0 is based on an analysis of 115 indicators addressing 70 targets and 16 goals. The indicators are broadly aligned with the National Indicator Framework (Government of India 2021a). The measurements were refined compared to those undertaken for Index 1.0 and Index 2.0 in the years 2018 and 2019 respectively. There are limitations for such an exercise due to non-availability and problems of compatibility of data gathered from various sources. Besides, data are mostly on use-related indicators and there are few observations on the status of capital resources or adjustment for planetary pressure essential for sustainable development. Grouping of the indicators under the 16 goals may also be debated. It is also important to note that accomplishing SDGs within a given time frame may not necessarily get translated into sustainable development. Nevertheless, identification of indicators under each of the development sectors and to assess Kerala's position therein,

quantitatively, helps in the planning process and fixing the state-level priorities. In addition, this exercise provides a platform to compare the performance of the states and share their experiences in meeting the sustainable development goals.

Kerala's performance under SDG

In 2016, when Kerala completed 60 years of its formation as a constituent province of the Indian union, it outshone the other states in India in human development indicators that have been crucial (Table 1). Even in per capita income, Kerala, which was earlier lagging behind, is now placed well above the national average and is counted as one among the first few major states in the country. The final country report of India on Millennium Development Goals (MDG) mentions the achievements of the state in fulfilling all MDG 2015 targets much before than the national commitments (Government of India, 2017). According to the UNDP-NITI Aayog report (Government of India 2021b), 'SDG India-Index and Dashboard 2020-21-Partnerships in the Decade of Action' India's overall SDG index stood at 66, 6 points up compared to that of the 2019 status when the national score was 60. Kerala securing an aggregate SDG index value of 75 tops among all states in India. In 2019 also, Kerala recorded the national highest score of 70. State-level analysis for 2020-21 indicated that fifteen states among 28 states in India recorded an aggregate SDG index of 65 and above. These states are grouped as 'Front runner' states. The rest 13 states are in the category of 'Performing' states with an index score of < 65. The major states like Odisha, Rajasthan, Madhya Pradesh, West Bengal, Uttar Pradesh, Assam, and Bihar belong to this category. The other two groups are 'Achiever' (SDG index 100) and 'Aspirants' (<50). There are no states under the groups of 'Achiever' and 'Aspirant'. These cut-off values are also used for individual SDGs.

Although, Kerala ranked number one with the highest overall SDG index, disaggregating the data for each of the 16 SDGs it is found that Kerala occupies top position only in the case of SDG 2 and SDG 4 and shares the top position with 15 other states in case of SDG7 **(Table 2)**. Her position is not at the same level in the case of the rest of the 13 SDGs. In fact, Kerala falls under the category of

'Performing' states with an index value of <65 for SDG 5 (Gender equality), SDG 8 (Decent Work and Economic growth), and SDG 9 (Industry, Innovation, and Infrastructure). Kerala improved her position compared to 2019 when its score was <65 each in the case of six SDGs. The coefficient of variations (CV) of SDG indices for the fifteen states that are grouped under the category of Front runner ranges from 14.63% in Kerala to 27.9% in Tripura **(Table 3)**. The SDGI and CV is inversely related **(Fig 1)**. Kerala's top position at the national level is supported by her moderate and even performance in most of the SDGIs as manifested through the low CV. Comparing the human development index with SDGI it is found that human development alone is not sufficient to meet SDGs **(Table 3)**. This is amply demonstrated when the case of Goa is considered. During the 1990s human development in Goa used to be compared with that of Kerala, and in those days, the Kerala model used to be referred to as the Kerala-Goa model in some academic parlance. Goa continues to maintain a comparable position with Kerala in the matter of HDI bagging the 2nd rank in 2019, however, in the case of SDGI Goa shares the 4th rank along with three other states of Karnataka, Uttarakhand, and Andhra Pradesh. What is more intriguing is that Goa's CV in SDGI is 23.9%. Unlike Goa, Kerala has relatively succeeded to consolidate its position in other related sectors as well apart from human development.

Human Development- A step towards social resilience in Kerala

Social resilience comprises three dimensions: coping capacities, adaptive capacities, and transformative capacities (Keck and Sakdapolark, 2013). It pervades individuals, communities, institutions, and governance structures as resilience-building is both a technical and political issue. Kerala has succeeded to act in both these counts to achieve human development. Relatively better performance of the state in the human health and education sector, compared to other states in India, without a simultaneous rise in per capita income, large scale industrial development and urbanisation during the 1970s drew wide attention. While analysing this achievement, the CDS-UN study (1975) underscored the significance of services like education and health to build up human capital and vital in brining qualitative changes in the entire process of development

(CDS, 1975, 2000). Since then, the Kerala model has emerged as a development discourse and over the years gained national and international acclaim. Kerala's experience also signifies that social sector development and resilience-building are possible through effective public action (Dreze and Sen, 1989; Pillai, 2008). Kerala case has been widely upheld, discussed and critically analysed by national and international scholars (Tornquist and Tharakan, 1995; Franke and Chasin, 2000; Isaac and Franke, 2000; Veron, 2001; Chattopadhyay and Franke, 2006; Ravi Raman (ed), 2010; Chattopadhyay, 2019 among others). What emerges from all these studies is that apart from geographical positioning and natural resource base (Chattopadhyay, 2021), the historical legacy in education and health care particularly under the princely states of Travancore-Kochi, public policy and affirmative government actions since the formation of the State and its first elected left government, vibrant civil society, and awareness and social consciousness of people including their willingness to take part in the governance have contributed to this development. The land reforms were the major policy interventions in 1957 that not only provided a large proportion of people, access to the land but, over the years, also catalysed a silent cultural revolution through psychological boosting and instilling confidence among the young generation of neo-owners. This has a tremendous impact on individual capacity building and social and cultural development. Higher investment in the health and education sector has contributed to strengthening human resource base. All these have been further accentuated through initiatives by the political class to promote decentralisation, draw more and more people, particularly women in development activities, institutionalisation of the process of participation and decentralisation, and creation of socio-political-technical space for debate. The Kerala model is being continuously reworked and strengthened. This has helped the State to move forward and make a distinct mark in the development trajectory.

People's Plan Campaign: Bringing People in the Forefront

Kerala is perhaps 'the most important example in Independent India of the power of public action to improve the well-being of the people and to transform social, political and cultural conditions in a State' (Kerala State Planning Board, 2021:1).

Kerala's tradition of social mobilisation continued and intensified over the years. It has spread in various areas from science popularisation to environmental protection to total literacy to people's plan campaign (PPC). All these movements saw the involvement of a large section of people cutting across the social strata. Some of these movements are localised, whereas some others are state-level initiatives with the active involvement of the Government machinery like the literacy movement and people's plan campaign. Total Literacy Campaign in the 1980s evolved as a mass movement with participation of people voluntarily in the programme as well as meeting local logistics. While Government actions created the enabling environment, it was the involvement of larger society covering people of all walks of life that generated new dynamics. In Ernakulam district, the first fully literate district in the country, the literacy campaign had 42 voluntary organisations and groups involved in achieving the total literacy (Sivadas, 1991). The socially charged atmosphere went further incumbent for both - illiterates and literates to get involved in the reciprocal process of learning and teaching (Tharakan, 1990). A synergy was developed among Government Organisations, Non-Government Organisations, the People's Science Movement, and common people.

The people's plan campaign launched in 1996 under the aegis of Kerala State Planning Board was a game-changer both for theory and practice of decentralised planning and mobilisation of people for planning (Chattopadhyay, 2017). Strongly rooted local democratic planning and decentralised development structure are the core element of Kerala's many movements and experiments in democracy, equality, and participation (Chattopadhyay and Franke, 2006). The details were meticulously worked out (Isaac and Franke, 2000) to implement this unprecedented, original, innovative, and audacious programme (Bandyopadhyay, 1997). There was a massive training programme of state-level Key Resource Persons (KRP), District Resource Persons (DRP), and Local Resource Persons (LRP) and enrolment of Volunteer Technical Expert composed of retired government servants, teachers from the school, college, universities, and technical colleges, professionals from Science and Technology organisations and other experts willing to offer their services for this massive campaign **(Table 4)**. It generated 1000 Panchayat Development Reports, one each for each panchayat, and identified more than one lakh local projects.

This PPC experiment has initiated a new process of planning that can be viewed from several perspectives. We mention here some of them:

(a) The decentralisation promoted in this experiment tried to bring the government to the people in contrary to the withdrawal of government that many of the proponents of decentralisation advocate. The PPC devolved administrative, financial, and project execution power by activating the local self-government organisations like Panchayats and Grama Sabhas and building local capacity. Unlike other states, Kerala is implementing the constitutionally mandated Panchayati Raj Act (73 and 74 constitutional amendments) to its true spirit.

(b) The PPC has set the process of localism with emphasis on local culture, local history, local resources, local plan, and local people. The Development Report prepared for each panchayat begins with local history and culture. The PPC has succeeded to mobilise the energy of thousands of activists and volunteers and instilling confidence among people that they can participate in plan preparation and support providing technical inputs based on their local knowledge.

(c) The PPC has succeeded to involve technical experts and draw on social capital for social transformation at the ground level. Volunteer Technical Corps (VTC) were formed with four thousand volunteers. The VTC were deputed to spend at least one day per week and to help, evaluate and improve the proposals of various development projects prepared by the Gram Panchayats. Around 50% of VTC were Graduates, Postgraduates, M.Phil and Ph.D. degree holders and another 41% were professional.

(d) Perhaps the most important gain that has a long-term implication is that the PPC has succeeded to create and enlarge the democratic space for socio-technical interactions and deliberations on development at the ground level.

The entire process of PPC promoted cooperation, collectivisation, local dynamics, and help build social resilience. It has strengthened the Kutumbashree programme,

which was initiated almost during the same time. At present, Kutumbashree is one of the most important programmes effectively dealing with alleviation of poverty and women empowerment, inspiring other states as well. The PPC programme has ignited several other initiatives like participatory watershed management. The recently launched participatory river restoration programme also draws its inspiration from the PPC.

Civil Society and People's Science Movement

Kerala is, globally, well known for strong and innovative civil societies, which provide the space for citizens to emerge creatively and collectively to strengthen public sector and access to goods (Tornquist, 2021). The high level of education and literacy, active involvement of people and communities, and political awareness have transformed people into communities and organisations dedicated to the cause of sustainability. These are socio-religious organisations, environmental action groups and women groups having the long history of being associated with various social activities in the sectors like education, health, welfare of the underprivileged groups, marginalised groups, and so on, since the early part of the 20th century. There efforts could be seen reflected in achieving major improvements in the sector of health and education and the same can be partly attributed to their involvement. Kerala Sasthra Sahitya Parishat (KSSP) with the slogan "Science for Social Revolution" spear-headed a strong people science movement (PSM) since 1960 (Ekbal and Isaac, 1988). The political air of Kerala has also been vibrant with active presence of various associations and trade unions formed under political patronage. Civil societies in Kerala could reproduce a socio-political space that offered a platform for expression of individual's concern, bringing people together from different sections of people, awareness campaigns , discussions forums, and establishing a bridge between government authorities and common public to smoothen the access to public goods. This has facilitated the mainstreaming of local issues into policy making and deliberations. The same has enabled to set a development agenda that has recognition of local problems and also the solutions. The civil society and government had been mutually reinforcing the societal change in a progressive direction, leading to a real democracy in Kerala (Tandon and Mohanty, 2000).

Kerala's Challenge to Sustainability

There are several challenges in Kerala's way to treading the path to sustainability. We propose to deal with two issues related to social and ecological resilience. First, it is the spatial gap in social and human development, and the second part refers to environmental changes.

Spatial gap in social and human development

Kerala model is well appreciated for its potential to emerge as an alternative development narrative, however, there are certain limitation as indicated in some quarters. One of the issues often debated is that the general discussion on the 'Kerala Model' is mostly based on aggregate average data with little reference to the spatial disparities. There are outlier communities lagging behind the central tendency and certain social groups seem to have been bypassed (Kurien, 1995; Kabir, 2010; Chakraborty et al., 2010). Examining spatial variability of social development based on 25 indicators indicates that spatial distribution of life expectancy and male literacy has been most equitable, whereas, the population growth rate is most variable (Chattopadhyay, 2019). The distribution of SC and ST populations also vary widely. This analysis has brought out three broad trends in the context of spatial variability: (i) There is a north Kerala (Malabar) and south Kerala (Travancore) divide, which is primarily a product of political geography. The northern part still bears the brunt of colonial rule. (ii) The second factor is related to physiography. The topographic grain of the state is longitudinal. The settlements are ribbon-like and in a continuous chain from one end of the state to the other end along coastal plain and midlands. The degree of development performance diminishes from the coastal plain in the west to the highland region in the east. The areas characterised by rugged topography and steep slopes are found to be lagging behind. (iii) The third factor underpinning spatial variability is related to the concentration of social communities. The fishing community lives mostly along the coast and backwaters. They are lagging behind compared to other communities living in adjoining areas. Similarly, a high concentration of SC ST populations is found in the interior districts within the Western Ghats. Apart from these locational factors, privatisation of education and health sectors has enhanced spatial variability. In one hand Government services tend to reach the

deprived areas and reduce spatial disparity, on the other hand growing private investment contributes to spatial inequality. This trend has increased specially after globalisation/ economic liberalisation. The government's withdrawal from social service sectors may worsen the situation. Future challenges of social resilience in Kerala will be to reduce these spatial disparities.

Environmental Change in Kerala

Kerala enjoys unique geographical settings and a well-endowed environmental resource base (Chattopadhyay 2021). However, there is rapid environmental change that can erode many of the social development gains and strain the development process (Chattopadhyay and Franke, 2006, Chattopadhyay, 2021). These changes brings fundamentally a new set of challenges that cannot be simply viewed as a continuation of past concerns about the environment and sustainability. The changes are reflecting the human pressure on earth system processes that are local and also planetary affecting the regenerative capacity of the biosphere. Some of the changes related to the planetary process of climate and local and regional ecosystems of land, water, and biomass are well evident across the state. Available studies indicate that the temperature is increasing, the maximum increase of around 1.5oC is noted in the high ranges followed by the coastal tract and midlands (Gopokumar, 2011). Rising temperature has serious implications on agro-climate, especially, soil moisture regime and agricultural productivity, particularly in the case of shallow root crops. Urban heat islands are also growing with the expansion of surfaced areas and following the construction boom. The trend and pattern of rainfall witnessed change. The peak rainfall period is shifting. High-intensity rainfall with the intervening dry period now characterise the monsoon months. It causes floods and drought simultaneously. Climate-related disasters have increased during the last couple of decades. Storm surge and tidal flooding are affecting many areas along the coast. Sea level rise will further compound this situation, particularly along the coastal tracts.

Changes in land and land use and water regime are major causes of concern. Land use change is a serious matter. Kerala's land is lateritic and undulated. Over 80% of the total area has an inclination of >15% (Chattopadhyay and

Chattopadhyay, 1995). The hills / undulated topography, which has attained slope stability due to the prolonged weathering process, are now grossly altered. The hard rocks are being quarried for building materials and the hard crust laterites are cut as laterite bricks. The soft lateritic hills are excavated to fill up low lands and paddy fields. This process has been accelerated during the last two decades with changes in the settlement system in favour of high-rise buildings, particularly around major urban centres. While building stones and laterites are extracted from topographically elevated areas, clay and sand are being mined from flood plains and also in-stream. In coastal areas, sand dunes are removed for various purposes. Removal of material alters topographic configuration. Local base levels are altered, water stagnates, sediment balance changes, and even the groundwater regime is affected. All these trigger a host of immediate and long terms changes.

The rate of soil erosion is high due to the high-intensity rainfall. Land-use change and gross human intervention in slopes have further aggravated the rate of soil loss as evidenced by wide-spread landslides during monsoon months. More than 55% of the net sown area is affected by accelerated soil erosion (Government of Kerala 2014). The average annual soil loss from the Western Ghats is around three times higher than the normal rate. The land productivity is falling gradually with a consequent increase in the use of fertilizer. High fertilization has resulted in soil and water pollution. The area under non-agricultural use is increasing in the state. The ratio between food and non-food is now in the favour of non-food crops and there is also an increase in fallow areas. The area under rubber accounts for 21% of the gross cropped area (Government of Kerala 2020). Water requirement for rubber has been estimated at 14,221m3/ha/year (Mangmeechai, 2020), almost three times that required for rice cultivation. It brings tremendous stress to the water regime. Replacement of natural vegetation by plantations and other crops changes forest ecosystem services and has a wide range of ecological and economic implications. Change in the forest cover affects the hydrological system, water balance, and micro-climate.

Kerala is well endowed with freshwater availability by having around 300 cm of annual rainfall which is well above the all India average. While the seasonal

rainfall is more or less constant blue water (water in rivers, reservoirs, wetlands, and underground) availability is decreasing due to shrinkage and dysfunction of traditional water structures and deterioration of water quality. Encroachment on river bank and wetlands, flood plain occupancy, removal of floodplain materials, river bed mining, cutting down of riparian vegetation, deterioration of ponds, tanks, and lakes all together reduce the water retention capacity of the state. Around 44% of wetlands in Kerala have been deteriorated and made available for other landuses. Base flow of all rivers in Kerala has substantially reduced and instantaneous flow increased due to land use change in the river provenance. Deterioration of water quality is an emerging problem, which can severely impact human health and impinge upon the economy (Chattopadhyay, 2020). The nutrient load of water bodies is also consistently on rise and in some cases, it is alarming (David, et al 2016). Forty-seven percent of all water sample sources tested are found contaminated, especially bacteriological contamination (SPB, 2018). The Coliform content of water is also increasing. Unsafe water, lack of sanitation, and hygiene is the leading cause of mortality and morbidity in several countries. Kerala has recorded a 35.6% increase in waterborne diseases from 2012 to 2016. Kerala's case of relatively better performance in the development sector during the past couple of decades but the growing deterioration of water quality is contrary to that hypothesized through the Environmental Kuznets Curve (Chattopadhyay, 2020). This indicates that water quality is a growing problem with development. It is a complex issue and warrants deeper investigation.

The Principal drivers of these changes are the exponential growth of anthropogenic activities, high population density (860persons/ sq. km), growing urbanization, distributed settlement pattern, intensive use of land, plantation agriculture, lack of control on effluent discharge, ineffective sewage management, and interference in natural ecosystems like forests and wetlands. These environmental issues warrant urgent attention for building ecological resilience and protecting biophysical resource base for Kerala. This is a governance challenge enveloping both social and ecological issues.

Social and Ecological Framework for Sustainable Development in Kerala

Considering the irreversible environmental change that affects the earth system stability and negatively impacts the development process, the 2020 human development report of UNDP (2020) suggested a new generation of human development index (HDI) with provision to adjust planetary pressure. Accordingly, the HDI value of all the countries has been reworked for the year 2019. The world average HDI of 0.737 now stands at 0.683 under PHDI (Planetary Pressure adjusted HDI). In the case of India, the HDI value of 0.645 has been reworked to 0.626 under PHDI (Ibid). Per-capita carbon dioxide emission and per-capita material foot print have been considered to work out planetary pressure. The importance of internalising the state of natural capital, future change, and sustainability parameters in computing HDI is now well realised. It is accepted that environmental degradation will tend to retard human development and therefore protection of the ecosystem and natural resource base is a planning imperative. The majority of environmental stressors are of societal origin and human-centred. Therefore, considering environmental problems as simply ecological challenges for future development as part of sustainable development initiatives and addressing them only through analysis of biophysical processes will not yield desired results. Usual conservation methods and simplified institutional prescriptions referred to as 'panacea problem' are not sufficient (Ostrom and Cox, 2012). A social-ecological analytical frame is necessary to understand the problem, and suggest ameliorating measures and policy interventions. It is important to initiate reasoned deliberations about these challenges and communicate to larger society for involving general people and public debate.

The social ecological frame considers humans and nature as part of a single system where the biosphere is the global ecological system integrating all living beings and their interrelationships including human and human actions as well as their interplay with the atmospheric processes, water cycle, biogeochemical cycle, and the dynamics of the earth system as a whole (Berkes and Folke, 1998; Folke et al., 2016). Adopting this frame for analysis of environmental problems and

finding solutions is partly a new way of strategic spatial planning to understand complex, dynamic, and non-linear human-environment relationships with a specific focus on the materiality of ecological conditions (Wilkinson, 2012). The multi-tiered diagnostic approach proposed by Ostrom and Cox (2010) for social-ecological system analysis is one of the commonly used methods. It consists of resource systems, resource units, governance systems, actors, and action situations. This frame may be adopted for Kerala with necessary modifications (Table 5). Social-ecological system analysis of each of the ecosystems like the forest, agriculture, plantations, fisheries, water resources, etc. may be undertaken and resilience level worked out. In certain cases, where users interact with multiple resources second-tier variables can be integrated through governance and actors with the biophysical system (Palomo and Hernandez-Flores, 2019). This analysis will help understand the nature of the problem and which threats may be dealt with by local users, and which requires complex solutions that include cooperation and management strategies - important considerations for governance. The threats or drivers affecting ecosystem services operate on different spatial and temporal scales and are often not independent of one another and there exists a mismatch between the scales at which ecosystem functions and the scales at which institutions operate.

Kerala has demonstrated the importance of micro-level decentralized planning, panchayat level initiatives, localism, empowerment, and people's participation in development initiatives. The state can draw from this experience and develop a road map to analyse social and ecological systems and build resilience. The ecosystem-based/ resource-based analysis can be further strengthened through household-based analysis as is being done for poverty alleviation programmes. The functioning of the social-ecological system is complex due to role of individual actors in resource management and human nature interaction. Therefore, the dynamics can be properly captured by analyzing practice linking households to the systemic level (Ruiz-Ballesteros and Ramos-Ballesteros, 2019). The SES analysis requires new knowledge generation. In recent years there is an attempt in Kerala to transit to a knowledge-based economy and knowledge society through sustained efforts to apply science and technology, modern skills, and appropriate policy interventions. The transformation is from a resource-intensive society to a knowledge-intensive society. The proposed knowledge-intensive society will

be deeply innovative, dependent on the use of human knowledge, sensitive to natural and environmental resource use, and ecological resilience. Formation of the human capital, precision management, efficient resource use, multilevel decision making, and new knowledge generation are integral parts of the knowledge society. The focus will be to adapt or transform in the face of change, particularly unexpected change in the social-ecological system and continue to support the welfare of the society. It will pave the way for nature-based human development, which suggests nesting social and economic development within the ecosystem and the biosphere, and tackle climate change-related problems, ecosystem protection, and human wellbeing as part of an integrated social-ecological system, and finding nature-based solutions putting people at the core. Kerala has followed the development trajectory considering people at the core, it needs to progress further and to embed the society as part of the environment.

Conclusion

Kerala has acquired its social resilience through investment in human development as has been highlighted in this paper. It offers several important lessons. The State had a strong historical legacy of health and education development which was further nurtured by the elected governments, post-state reorganisation exercise in 1957. Apart from increased state spending in these sectors, there were land reforms benefiting a large section of people. This has not only provided access to land resources but also instilled confidence among the people and helped overcome cultural barriers. The state's commitment to decentralisation is well evident through administrative reforms and adopting Panchayat raj acts. There is a continuous attempt to implement forward-looking and innovative programmes like PPC, create an inclusive society and enlarge democratic space for participation and flourishing of civil society. Recently, the state is performing well in per capita income and economic growth. Early investment in the human capital building has facilitated this process. Kerala has also turned into a consumer state importing bulk of her consumables from other states. The increase of disposable income in the hand of a large section of people in Kerala has contributed to the emerging trend of consumerism and privatisation.

On the development front, the state is moving towards a higher trajectory with a major thrust on knowledge-based industries and quality improvement of services. However, there are several challenges including intra-state disparities in social and economic development sectors, the state of the environment, financial limitations, and increasing thrust on withdrawal of State from social service sectors. Globalisation has added another level of challenges in the growing privatisation of services and ex-situ decision-making. While overall social resilience is being built up there are spatial gaps in social and economic development and emerging challenges of environmental degradation that warrant proper attention. The geographical advantage that the state enjoys, and the resilient ecosystem with high biodiversity that the state inherited seem to be waning under the Anthropocene. Climate change will further aggravate the problems and will impact the entire fabric of society. The state can build up on the foundation that has already been made through its affirmative actions for human develomnet. It can adopt the social-ecological system approach as part of spatial planning in the course of pursuing a knowledge-based economy and try to embed the development programmes within the broad frame of the nature. This will improve Kerala's resilience and help pioneering efforts to achieve sustainability.

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Table 1 Selected human development indicators of Kerala and India

Sl. No	Indicators	Kerala	Rank of Kerala in India	India
1	Population growth rate (annual) (2001-2011)*	0.48	1	1.63
2	Life expectancy at birth (2011-2015)*	75.2	1	68.3
3	Life expectancy-Female (2011-2015)*	78.2	1	70
4	Infant Mortality Rate (IMR) per 1000 live births (2016)*	10	1	34
5	Maternal Mortality Ratio (MMR) per lakh live births (2020)**	43	1	113
6	Literacy (2011)@	93.91	1	74.04
7	Female literacy (2011)@	91.98	1	64.6
9	Sex ratio (2011)@	1084	1	943
10	Incidence of poverty (2013)$	7.05	2	21.92
11	Human Development Index (HDI) (2019)#	0.782	1	0.645
12	Sustainable Development Goal Index	75	1	66
13	Per capita income (PPP INT$) 2019-20	11,153	9	7,333

Source: *Health and Family welfare statistics in India, 2017; ** UN-NITI Aayog, 2021 @Census of India; $Reserve Bank of India, 2013; # Sub-national data base, Global Data Lab, hdi.globaldatalab.org; PPPINT$- Purchasing Power Parity in International dollar following conversion rate of IMF

Table 2: SDG for development sectors and Kerala's position

SDG	Development sector	Kerala, index (Rank)	Highest index attained and (State)
SDG 1	No poverty	83 (III)	86 (Tamil Nadu)
SDG 2	Zero hunger	80 (I)	80 (Kerala)
SDG 3	Good health and well being	72 (XIV)	86 (Gujarat)
SDG 4	Quality education	80 (I)	80 (Kerala)
SGD 5	Gender equality	63 (II)	64 (Chhattisgarh)
SDG 6	Clean water and sanitation	89 (VIII)	100 (Goa)
SDG 7	Affordable and clean energy	100 (I)	100 (15 states)

SDG 8	Decent work and economic growth	62 (XII)	78 (Himachal Pradesh)
SDG 9	Industry, Innovation and Infrastructure	60 (IX)	72 (Gujarat)
SDG 10	Reduced inequality	69 (XIII)	78 (Himachal Pradesh)
SDG 11	Sustainable cities and communities	75 (XVII)	91 (Punjab)
SDG 12	Responsible consumption and production	65 (XXIII)	99 (Tripura)
SDG 13	Climate action	69 (II)	70 (Odisha)
SDG 14	Life below water* (for coastal states only)	53 (VI)	82 (Odisha)
SDG 15	Life on land	77 (VI)	93 (Arunachal Pradesh)
SDG 16	Peace, justice and strong institutions	80 (V)	86 (Uttarakhand)
SDG 17	Partnerships to the goals	Not computed at the state level	

*Based on increase in area under mangrove and development of aquaculture only. Quality of coastal waters not considered due to lack of a fixed standard

Source: NITI Aayog (2021): SDG India Index and Dashboard 2020-21, Partnerships in the decade of action. Government of India, New Delhi.

Table 3: SDGI, Coefficient of variations (CV) and human development index (HDI) of front Runner states under SDGI

States	HDI	SDGI**	CV
Kerala	0.782	75	14.63
Tamil Nadu	0.709	74	14.84
Himachal Pradesh	0.725	74	15.21
Karnataka	0.683	72	17.68
Sikkim	0.717	71	18.29
Uttarakhand	0.683	72	19.22
Haryana	0.708	67	20.11
Andhra Pradesh	0.694	72	20.75
Punjab	0.724	68	22.01
Maharashtra	0.697	70	22.82
Gujarat	0.672	69	23.6
Goa	0.763	72	23.89
Telengana	0.669	69	24.3
Mizoram	0.704	68	26.82
Tripura	0.658	65	27.9

Data Source:*Sub National data base-Global data lab. **UN-NITI Aayog, 2021;

Table 4. Details of the Training Programme, People's Plan Campaign, 1996

1. Training Module Topics:

Challenge of development, Philosophy of decentralisation, Local rules and statutes, Role of Grama Sabhas, Participatory Rural Appraisal (PRA) techniques, Secondary data collection and analysis, Preparation of development reports, Project preparation, Plan document preparation, Plan Appraisal, Sectoral development perspectives, Implementation of projects, Micro level development models, SC, ST and gender issues, Resource mobilization.

2. Training personnel:

i). 600 Key Resource Persons (KRPs) or state level experts got 20 days training

ii). 15,000 District Resource Persons (DRPs) got 14 days training.

iii). 100,000 Local Resource Persons (LRPs) got 3 days training.

iv). 10,000 Volunteer Technical Experts enrolled.

3. Composition of the trained personnel:

Women	24.82 per cent
SC/ST	2.75 per cent
Government Officials	5.47 per cent
Others	66.96 per cent

Note: Composition per cents in section 3 are overlapping

Source: Kerala State Planning Board, Thiruvananthapuram 1998; cf Isaac and Franke 2002:68–69, 76–77, 164, and 177–79.

Table 5: Social ecological analytical framework for Kerala

Resource system	Resource Units	Governance system	Actors	Action situations
Sector	Resource unit mobility	Government organization	Stakeholders	Process
Location	Size	Non-Government organization	Socio-economic attributes	Conflict resolution
Boundary	Growth/ replacement rate	Hierarchy	History of use	Provision
Size	Economic value	Rules	Location	Appropriation
Productivity	Distinctive characteristics	Property rights	Leadership	Policy making
Equilibrium properties	Spatial distribution		Social capital	
Human intervention	Temporal distribution		Knowledge	
Predictability of the system dynamics	Change/ Transformation		Resource dependence	
Storage capacity			Technology used	

Adopted from Ostrom and Cox (2010); Palomo and Hemandez-Flores (2019)

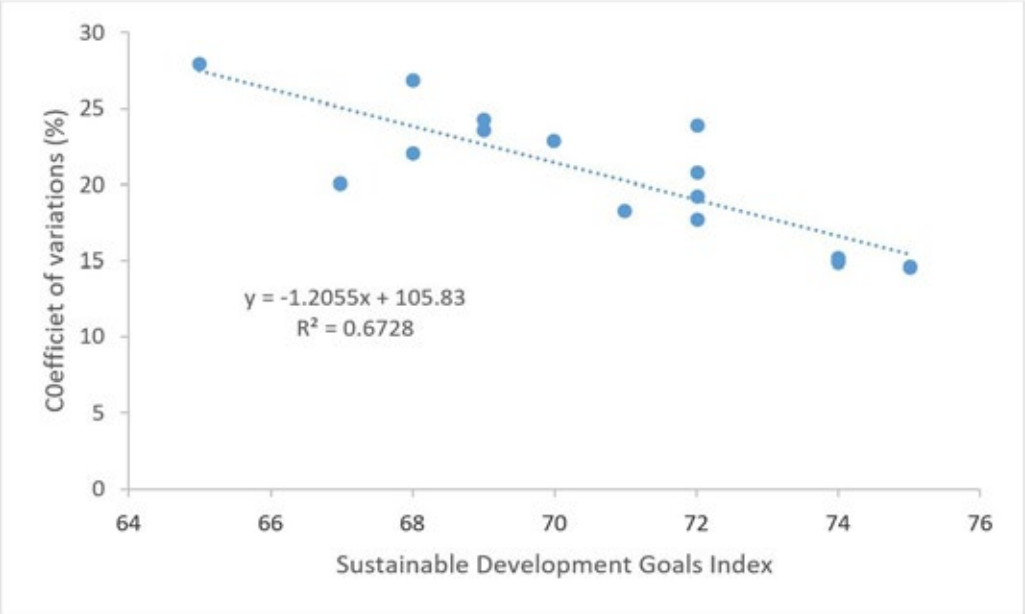

Fig. 1 Sustainable development goal index and coefficient of variations

The Green Oasis in the Maximum City Mumbai

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Key words: Sanjay Gandhi National Park, Mumbai, City, Biodiversity, Flora, Fauna, Sustainability, Green Oasis

Introduction

Author Suketu Mehta has bestowed a moniker to the bustling Metropolis Mumbai, the “Maximum City”, the “city which never sleeps”. Mumbai, the capital city of Maharashtra holds the largest population of any city in the country. Standing at 4th place, it is one of the most populated cities in the world. According to the 2011 census (which is the last census conducted), Mumbai's Urban Agglomeration is at 20,748,395, while the city itself was recorded at 12,478,447. It is estimated that Mumbai’s population is over 22 million. It is the country’s largest, not only in terms of population but also trade and business. The city has seen a tremendous spike in population in the last two decades. This meteoric rise in population is said to have brought about by migration of people from other parts in the country for employment and business opportunities. This rapid influx of migrants, leading to the rise in population has also led to serious civic and health issues that are being addressed by the government. A matter of concern is that a large fraction of the Mumbai populace dwell in the teeming city slums. These slums are devoid of open and green spaces and usually have poor ventilation and hygiene.

With a major metropolitan area that covers 4,355 square kilometers (1,681.5 square miles) that cramps a bustling population within it and with population densities

of approximately 73,000 per square miles, Mumbai is definitely a megacity. As land and housing is at such a premium, a major chunk of people often resort to residing in cheap, cramped up housing a long way from their work place, resulting in long commutes on the city's busy public transport systems of buses and trains.

The city of Mumbai is fortunate enough to have an emerald crown at its northern reaches in the form of the vast forest of Sanjay Gandhi National Park (SGNP). With an area of around 107 sq km, SGNP is the largest national park in the world to be located inside a bustling urban metropolis. The park is identified as a carbon sink for the city and is often termed as the green lungs of Mumbai. Being the largest open space in the city, SGNP attracts a lot of citizens who want to get away from the hustle and bustle of the daunting city that engulfs this beautiful landscape. It is of significant recreational importance. In recent times a large number of locals go for walks in the Krishnagiri upvan zone of the park every morning. The park plays host to over 2 million annual visitors, who flock to experience the invigorating flora and fauna and its habitat. The two lakes in the park, Tulsi and Vihar, contribute to the city's water supply.

Through the SGNP's nature information center in the Krishnagiri upvan, the park reaches out to the city's people by conducting nature trails, nature education and awareness programs and other fun activities within the park. The presence of 2400-year-old Kanheri caves, carved out in a large basaltic rock outcrop, in the hills of SGNP is an added attraction of this place. The fascinating greenery of this park encourages great moments of meditation and self-reflection. The gorgeous sight of the lakes, river, valleys and hills provide a green oasis like experience to Mumbaikars.

The park also conducts a tiger and lion safari which attracts about 2 million tourists every year. Special buses equipped with safety precautions are provided for the twelve-hectare long crisscross roads for the safari. With Thane district in the north, Aarey Milk Colony in the south, Borivali in the west, and Mulund in the east, the main entrance to SGNP is at Borivali. All these areas, with exception of Thane, come under the Mumbai Metropolitan Region. The park is well-connected to the rest of the city with other gates such as the gate ar Manpada and gate for Nagla block at Bhyander. National Highway 8 passes by the main entrance

of the park. It is a short walk/rickshaw ride from the nearest train station. The international and domestic airports are a few kilometers to the south of SGNP.

SGNP has included Indian Institute of Technology-Bombay and the Wildlife and WE Protection Foundation, an NGO for the assessment of the park's ecosystem services. These provide well-being to humans and to develop a revenue generation model for these services, a catchment treatment plan and a carbon sequestration plan with an aim to quantifying the monetary value of these services.

Evolution of SGNP

To better understand the evolution of our city forest, it is imperative to analyse how the city was shaped into existence first. The western coast of India is said to have formed back over 135 million years ago. During the early Cretaceous, when the Indian continental shelf detached itself completely from Gondwanaland and started moving north east towards Eurasia, north of the equator. Some 67 million years ago, while the big chunk of land lumbered its way northwards crossing the equator, it passed a region called the Reunion hotspot which in the present day, houses the French islands of Reunion. This period where the Indian continental shelf was over Reunion, marked the beginning of a cataclysmic phenomenon that shaped the future of the biogeography and life on the Indian subcontinent. Over the next 5-6 million years, a series of volcanic eruptions inundated the lands of prehistoric India with molten lava. An estimated total of 1.5 million km3 of lava spewed onto the crust from the depths of the earth, pooling onto the surface of the continent and eventually solidifying into unending sheets of basaltic igneous rocks called flood Basalt and forming one of the largest volcanic features known in the present day called the Deccan volcanic province. Mumbai was also part of Deccan and its geological crafting also started during this time. Waves of chronologically dispersed violent eruptions separated by periods of dormancy are attributed to the shaping of Mumbai. 65 million years ago, eruptions around most of the Deccan volcanic province had come to a halt. Mumbai's eruptions continued long after, lasting till as recently as 60 million years ago. The nature of these eruptions and its geographic position gave rise to many geological

quirks such as the presence of non-basaltic igneous rocks such as Rhyolites and Trachytes and features like volcanic pillows, breccia and tuffs. These features set Mumbai's geology apart from the rest of the province.

The present-day coastal Mumbai came into existence relatively recently in the geological timeline. For the longest time, there was land to the west of Mumbai. It was only at the end of the Pleistocene ice age some 12,000 to 15,000 years ago that water level started to rise and in the subsequent years drowned much of the coastal lands around India. Water rushed into the various river valleys of the city, forming creeks and lagoons. The sea level kept on rising, reaching its peak at about 3000-4000 years ago. Mumbai was soon turned into a group of hilly islands separated by shallow tidal lagoons. One of the earliest mentions of the forests in Mumbai can be dated back to 4th century BC, where a major trade route that connected busy ports of the city like Sopara and Kalyan passed through these dense coastal forests. It is noted in history, that the ancient Buddhist caves of Kanheri served as a rest house for traders and travelers commuting through these forests.

"BomBaia" was the name given by the Portuguese for these islands when they first arrived on these lands. A land that was predominantly inhabited by the *Kohli* fishing communities along with communities such as *Warlis* of the hills, farming communities such as Aagris, *Kunbis*, *Thakurs*, *Bhandaris* and a few others. Just north of the well-known seven islands of "BomBaia", separated by the shallow Mahim Bay, lay the land that hosted the forest that is now our national park, the larger islands of Sasashti or Salsette as it was referred to as by the Portuguese. Salsette was also an island complex and consisted of one large water locked landmass surrounded by numerous smaller islets. It comprised what is now called Mumbai Suburban, parts of Greater Mumbai and Thane district.

By the end of the 18th century, the Mumbai archipelago, was gradually turning into a bustling port town under the British raj. On the other hand, Salsette was still sparsely populated and a recent addition to the British empire. Much of it was forest covered hills and connected plains that were surrounded by rather unexploited shores. Its population during that time consisted mostly of local communities living in rural settlements and small townships. The construction

of Sion causeway by the British in 1803 linked Salsette to the Islands of Mumbai which by that time were welded together through land reclamation projects. This fortified Mumbai's trade connection with the mainland and opened new avenues for the British raj at the time. Thereafter the Salsette also started seeing a steady rise in population and northward expansion of Mumbai beyond the 7 islands. This is would eventually spark the creation of the Greater Mumbai Metropolitan region in the future. The mid-19th century saw the golden era in trade and commerce in Mumbai. It became the first Indian town to undergo drastic economical and societal advancement. Industrialization meant new job opportunities, which led to migrants pouring into the city.

This marked rise in population catalyzed the depletion of the meager hydrological resources of Mumbai. As a result, a series of water crises took place during the mid-1800s, prompting some mitigative steps. The first piped water supply scheme of Mumbai was constituted with the inception of Vihar Lake in 1960. Three earthen dams were built on the Tasso River near the Vihar village in the forested plains of Salsette to store the monsoon runoff from the catchment area of the Tasso. Consecutively, another event of water scarcity in 1885 called for the creation of another Dam on river Tasso, this time further upstream, causing the formation of another reservoir in the form of the Tulsi Lake by 1897. These lakes were nestled in the heavily forested region of Salsette. Both the lakes were fed by the monsoon runoffs from the Krishnagiri-Powai range of hills. These hills and its associated forest play a pivotal role in the hydrological systems of Mumbai to this date.

Soon after their completion, the ranges and adjoining plains surrounding the lakes were then privately owned. These were secured by the Bombay municipal corporation as their catchment area to safeguard these valuable sources of water. This land was a tiny fraction of the present-day park, with an area of just 10 sq kms. Nevertheless, this development marked the very beginning of the city's forest. Forests all around the nation were under tremendous pressure during the beginning of the 20th century. Exploitation of forests under the pretext of industrialization and urbanization, unsustainable agricultural practices, forest fires, etc. were eating away at these precious habitats. Natural resources from many nations were getting drained due to the unfortunate circumstances of World War 2 and India was no exception. Growing population of the country

meant this would only worsen if laws were not implemented. Hence the series of measures starting with the formation of Indian forest services in 1865, to the nationalization of the remaining pockets of forests of India by 1947 were of utmost importance for the survival of these habitats and its flora and fauna. Under the Indian Forests Act of 1927, laws were put in place that bolstered the security of these green spaces. This granted the forests around the lakes of Salsette, and national forests, protection by the relatively newly formed Indian forest services.

In 1939 the local government handed over the control of the 10 sq kms catchment area of Tulsi and Vihar Lake to the Maharashtra state forest department. The momentum in the growth of the National Park towards the forest we know today was seen post-independence. In 1947 under the governance of the state forest department an additional 21 sq kms was added to the already existing land making it a sizable total of around 32 sq kms of protected forest land. The year 1950 brought an important milestone in the form of the Bombay National Park Act. Under the provision of this act 20.26 sq kms of privately owned land was pieced together to form the Krishnagiri National Park. This development was different as its purpose was not only fortification of the catchment area but also preservation of the green pockets in the rapidly expanding city. The management of this area was briefly assigned to the department of parks and gardens of Bombay. It was assigned to the state forest department soon after. The following years were marked by several haphazard land acquisitions where the government incorporated privately owned lands and added them into the park. Just like Mumbai came to be an integration of islands, SGNP was quickly becoming an integration of privately owned lands. The notable benchmark in these following years was 1968, when the park was given an additional 47 sq kms under its protection. It was then renamed to Borivali National Park by a special committee presided by the chief minister of Maharashtra. Areas of the Nagla block situated north of the Bassein creek along with Yeoor and Chena areas in the Thane district were brought into the park's folds.

Conservation of Environment saw a lot of political tailwinds in the last quarter of the 20th century. The implications of these were seen at Borivali national park too. In 1975, with the Maharashtra Private Forests (Acquisition) Act, more privately owned land was added to the park. Though beneficial this was not without its own

set of problems. Most times these acquired lands were inhabited by tribals and non-tribals alike. This overlap of city and forest caused tension between the forest department and the inhabitants. This would be the cause of many problems in the future but more about that will be covered later. In 1980 with the passing of the Forest conservation Act prohibiting the de-reservation of forest land for any non-forest purpose caused a complicated situation in the light of the several inherent issues with the park. On 23rd June 1981 the park's name was changed one last time to Sanjay Gandhi National Park. Regardless of all the aforementioned issues, the Maharashtra Forest Department was now managing 93 sq kms of which 10 sq kms was set aside as a buffer zone. Subsequently, the state government added 20 sq kms more to the existing land, making the total size of the park to be a staggering 103 sq kms within the city of Mumbai.

Despite the political willingness to protect these habitats across India, the efforts fell short. The late 1900s brought about a challenging time for all the actors associated with this unique forest of SGNP. The ever-increasing pressure of population from the city and the porous boundaries of the park caused several issues. To better handle such challenges faced across the country, the Wildlife Protection Act of 1972 was amended in 1991. Thereafter, SGNP was declared by the state government as per the provisions of the amended act. There was immense tension between the city and the forest during this time. Encroachment was at its highest. These complications between the forest department, the inhabitants of the previously private lands, environmental activist groups and the forest's very own wildlife carried on into the 21st century. The repercussions of these affect the forest to this day. Yet, due to efforts and cooperation of the many individuals and communities the forest has finally found a footing in ever-growing Mumbai. In the most recent development 800 acres of land that was initially a part of Aarey milk colony was handed over to the forest department to be included as a part of SGNP, increasing the park's size to 106 sq kms.

The treasure trove of Wilderness

Sanjay Gandhi National Park lies on the Konkan coast of the Indian subcontinent. Nestled between the mighty Sahyadris to its east and the vast Arabian sea to its

west, it represents the moist broadleaf deciduous and semi evergreen forests of the Malabar coast. This ecoregion is typically observed extending from the coast up to the foothills of the Sahyadris about 250 m above the sea level, stretching from Mumbai right up to the southern tip of India. Unfortunately, throughout history the majority of this ecoregion has been cleared out due to the density of population along the Malabar coast. In the present day only a few patches of these forests remain in the form of scattered nature reserves. One of these is SGNP, along with others such as Phansad Wildlife Sanctuary and Mollem National Park. From *Euphorbia antiquorum* strewn grassy basaltic rock outcrops, to tall deciduous trees segueing into estuarine mangrove forest and scrubs, SGNP hosts a spectacular array of habitats within it. Topographically one can observe an amalgamation of hills, valleys, lakes and open areas. Due to the windward side of the ghats, the forests and its denizens are greatly influenced by the yearly downpour they receive, brought about by the westerly monsoon winds. Hence, a year in the park can be broadly demarcated into the wet and the dry seasons. Monsoons arrive at the park roughly around the end of May and within a few weeks, the forest comes alive with new luxuriant growth of greenery. A web of forest streams emerges, originating in the hill of SGNP and flow down through the maze of tall deciduous trees, enriching the wildlife in the process. The Monsoons reach their peak around July, usually flooding the lakes of SGNP which spill into the Mithi river drainage. After the monsoons pass, the dry season starts to establish itself with each passing day. The summer months paint a very different picture of the park. The vegetation of the monsoons recedes by this point; most trees have shed their leaves and created carpets of dried leaves. The forest becomes dry and water sources become concentrated in selected areas. Large herbivores such as Chitals (*Axis axis*) and large herds of the usually less seen Sambar (*Rusa unicolor*) are observed near the lakes in the valleys during this time.

Image 1: Pillow lava seen around the streams in SGNP, Photo credit: Naman Kaji

Image 2: Valleys of the Krishnagiri-Powai range of hills harboring the Tulsi and Vihar Lakes, Photo credit: Shantanu Majumdar

Image 3: Rocky plateaus in the park covered with grasses and euphorbia, Photo credit: Shantanu Majumdar

Flora

According to the Botanical Survey of India, Sanjay Gandhi National Park houses 1082 different species of plants and 31 infraspecific taxa within its limits. Four basic forest types are found in the park: moist Teak bearing forest, southern moist mixed deciduous forests, mangrove scrubs and western subtropical hill forest. Of the four, the most dominant forest type is the moist mixed deciduous. A walk through the low-lying areas of the park's forests will acquaint one with the key species that form the majority of the forest. Trees like Haldu (*Adina cordifolia*), Vat (*Ficus benghalensis*), Kandol (*Sterculia urens*), Karanj (*Pongamia pinnata*), Ain (Terminalia Elliptica), KaateSaavar (*Bombax ceiba*), Pangara (*Erythrina variegata*),

Kalam (*Mitragyna parvifolia*), Pandra kuda (*Holarrhena pubecens*), Shisham (*Dalbergia latifolia*), Bartondi (*Morinda tinctoria*), Kakad (*Garuga pinnata*), Kheir (*Senegalia catechu*), Bor (*Ziziphus sp.*), Koshimb (*Schleichera oleosa*) etc form the high canopies and understory of the forest. Teak is a rare tree in this type of forest. These trees are typically accompanied by Bamboo thickets, of species such as Manvel bamboo (*Dendrocalamus strictus*) and Katas Bamboo (*Bambusa arundinacea*), oftentimes forming dense curtains in the forest. Many large shrubs such as Murud sheng (*Helicteres isora*), Karvanda (*Carissa carandas*), Karkani (*Leea indica*), etc. are seen making up the undergrowth of these forests. Along the stream beds in the valleys of the park one can find an abundant presence of Karanj or the Pongam oil tree. These trees, with their greasy seeds, have evolved to be hydrochorous, that is, they use the flowing water of the streams to disperse their seeds, explaining their abundance. Another interesting characteristic of this forest type is the healthy presence of Lianas or woody climbers. These sturdy plants form a network of branches that connect the trees in the forests to one another in a way that helps many small arboreal animals to commute through the forest without leaving the safety of the trees. Ukshi (*Getonia floribunda*) is the most frequently encountered liana in SGNP and can be seen flowering profusely during the warmer months. The upper reaches of the hills of SGNP show a distinct resemblance in biota to the western ghats. One such place would be the highest point of Mumbai, sitting at about 468m above the sea level, often called Jambulmal, in the Krishnagiri range that also houses the famous Kanheri caves. Many species that are also well represented in the ghats can be seen here such as Anjani (*Memecylon umbellatum*), Gorbale (*Ixora brachiata*), Amba (*Mangifera indica*), Jambul (*Syzgium cumini*), the threatened Sita Ashoka (*Saraca asoca*), etc. Most of these plants are evergreen and form the subtropical hill forest patches of the park. Towards the north, the Bhayander-Naigaon (Vasai) creek separates the forest into two zones of unequal area, the northern or Nagla block and the larger southern block. It is only in the forests around the creek that one can find mangrove scrubs and its associated vegetation. Here, Tivar (*Avicennia marina*) is the most ubiquitous plant but one can also observe other halophytic species such as *Avicennia officinalis*, Kajala (*Aegiceras corniculata*), Chaura (*Ceriops tagal*), Marandi (*Acanthus ilicifolius*), Pilu (*Salvadora persica*), etc.

Image 4: The Beautiful flowering of Karvi (*Strobilanthes callosus*): A plant that flowers once in every eight years, Photo credit: Aditya Gadkari

Image 5: The Bridal Veil Stinkhorn Mushroom (*Phallus indusiatus*): one of the many bizarrely beautiful mushrooms seen during the monsoons in SGNP, Photo credit: Shantanu Majumdar

Image 6: Flowering a Foxbrush Orchid (*Aerides maculosa*): an epiphytic orchid species frequently seen in the park on rocks and trees, Photo credit: Aditya Gadkari

Image 7: Vinca-Leaved Ceropegia (*Ceropegia vincifolia*): A rare climbing shrub that traps insects to ensure pollination, found on the hills of the park, Photo credit: Naman Kaji

Image 8: Gibson's Hebanaria (*Hebanaria gibsonii* var. *foetida*): A rarely encountered orchid that is seen blooming in the park during late monsoons, Photo credit: Naman Kaji

Image 9: *Zingiber nimmonii*: A beautiful, strongly aromatic medicinal plant that is endemic to the western ghats that grows in certain areas of the park, Photo credit: Naman Kaji

One can witness many floral spectacles in SGNP. One such event is the gregarious flowering of Karvi (*Strobilanthes callosus*) that carpets many of the hill slopes in the park. These plants burst into beautiful violet blossoms only once every eight years, making them a novelty. In SGNP, the last mass flowering of Karvi was noted in 2016. The vegetation of SGNP is very dynamic and always seems to keep changing. Come summer, the forest loses a lot of its greens while dramatic hues of red can be seen popping up in the forest. This is caused by trees of Palash (*Butea monosperma*), Pangara (*Erythrina variegata*), Kaatesaawar (*Bombax ceiba*), Devsawar (*Bombax insigne*), Kaushi (*Sterculia colorata*), Dhayati (*Woodfordia fruticosa*), the exotic Gulmohar (*Delonix regia*), etc that go into flowering and are inundated with large flashy red and orange inflorescence during the period of March to May. Most of these trees have evolved to utilize ornithophily as a mode of pollination and hence have such big conspicuous inflorescence, so as to attract birds from far away distances. These trees are a hotspot for bird activity during summers in the park with the arrival of rains. The seemingly lifeless, leaf litter covered grounds are soon replaced by a myriad of ephemeral herbs, grasses, pteridophytes and mosses. One can come across beautiful lush carpets of Maiden's hair Fern (*Adiantum* sp.) covering wet walls and humus rich areas near streams. The battered bushes of Karvi slowly start coming back to life and swirly stocks of the Spiral ginger (*Hellenia speciosa*) start to spring up all across the park. Various fantastical looking mushrooms, which are actually fruiting bodies of the many species of fungi trying to propagate, can be seen popping up on plant matter and the ground. Beautiful splashes of colors start to decorate the forest floor, as much of the early ephemeral growth goes into flowering within a short duration of their first appearance. The Purple, white and yellow inflorescence of Raan halad or the Hill turmeric (*Curcuma psudomontana*) becomes a common sight. Just like the hill turmeric, many unique plants start to blossom in the park in this period. The stunning Crinum Lilies (*Crinum latifolium*) are amongst the first plants to flower during the monsoons. Plants such as the diminutive Kali Musli (*Curculigo orchioides*), groups of Kuli (*Chlorophytum tuberosum*and and *Chlorophytum borivilianum*), Pankusum (*Pancratium triflorum*), Khajkanda (*Ledebouria revoluta*), etc. can be seen growing abundantly in the park. As the monsoons progress, these early monsoon ephemerals are replaced by a new cast of species. The odd flower bearing stocks of the Wild yam (*Amorphophallus commutatus*) start to sprout out of the rain enriched forest soils, making their

presence known after a year of dormancy. Throughout suitable habitat in the park, pretty flowering herbs such as various species of *Begonias, Commelinas, Balsams*, etc. start to sprout up. The rocky basaltic hills of Krishnagiri and Yeoor are an exceptional place to observe this transient vegetation. During this time one can find many rare and endemic species of plants in the park which includes various seasonal ground orchids of genuses such as *Hebenaria* and *Eulophia*. The waning monsoon covers the side of the forest trails with the bright yellow flowers of the Sensitive Smithia (*Smithia sensitiva*). Plants such as the Spiral ginger, Pin-cushion plant (*Neuracanthus sphaerostachyus*), Wild Sesame (*Sesamum indicum*), Takla (*Senna tora*), etc are commonly seen flowering at this time too.

Due to the loss of green cover because of encroachment and the resultant lapses in conservation, many of the degraded areas were converted into plantations. These can still be seen flourishing in the park. The fast-growing leguminous tree *Gliricidia* has been extensively planted in the western part of the park and is a common sight now. This tree is directly competing with the native flora of the park and is usually considered to be a pest. Due to its accessibility SGNP has been studied by many renowned botanists very early on. Hence, a number of species of plants have SGNP as their type locality i.e., place of first discovery and specimen collection. This includes plants such as the mysterious *Ipomea salsettensis*, the critically endangered *Ceropegia odorata*, the highly medicinal *Chlorophytum borivilianum*, the rare perennial herb of *Dipcadi saxorum*, amongst others.

Fauna

Being part of an immensely rich biogeographical zone, SGNP mirrors its sheer diversity with the myriad of life forms within its lands. Throughout the years, a plethora of different species have been reported from the park. These include over 240 species of birds, around 40 species of mammals, 61 species of reptiles, about 14 species of frogs and an innumerable assortment of invertebrates. It is astounding to think that just a century ago, Tigers used to roam these city jungles. Unfortunately, the rapidly growing populace of Mumbai couldn't cohabit with these large felines and the last of the tigers was shot near Vihar Lake in 1939. If one looks at the history of SGNP, it can be clearly seen that the park saw a great

deal of loss in its biodiversity during the 20th century. Many species depleted considerably in numbers, while some completely disappeared from the forest altogether. The most obvious effect was seen on the park's macrofauna. It is said that even Gaurs were present in these forests in the distant past but vanished with the formation of the city. Animals such as the Bengal fox and the striped hyena, although historically present, have been lost in time. Hyenas were often considered to be vermin and killed due to superstitions surrounding the species. The last photographic evidence of the presence of the striped hyena in the park is a tragic one, where you can see two individuals lying lifeless with large bullet wounds on their head, clicked by naturalist and author Sanjay Monga, around 1986 in the outskirts of the park, in Goregaon.

Although the Tigers couldn't survive in SGNP, the highly adaptable Indian Leopard (*Panthera pardus fusca*) managed to not only survive but eventually even thrive in this confluence of two worlds that is SGNP. At present the Leopard is the undisputable flagship species of the park. The city forest has one of the densest populations of leopards of any place in the world. At a mind-boggling density of 26.34 individuals/ 100 sq kms, it is astounding to think how well these big cats are doing in a forest that is surrounded by two of the world's most densely populated metropolitan cities. They have not only adapted to living near humans but are even exploiting the new resources that these human dominated landscapes bring. A part of their success can be attributed to the lack of other large predators in the park along with the presence of abundant food sources. They are the apex predator in these lands. Apart from deer and langurs, leopards living near human habitation across India have taken to hunting stray dogs and domestic animals. Mumbai's leopards are no different, with stray dogs comprising 31% of their total diet according to recent studies. Secretive and reclusive, these felines are seldom encountered in the park but if one is fortunate enough to see one, these cats promptly disappear out of sight. Man-leopard conflict has been a major complication in the park, some of these took place in the past decades. A string of attacks during 2002 to 2004 caused multiple deaths and injuries. Although things have improved in the recent years, there have been occasional spates of attacks and some fatalities, especially in the human modified forests of Aarey Milk colony, on the western fringe of the park in Goregaon. It is noted that leopards that have grown up around humans usually avoid them. It is usually stressed,

injured or relocated leopards that are more prone to attacking. Relocation of these animals from suburbs like the Aarey milk colony is definitely not a solution as other individuals will eventually move in to fill the space. Education and awareness about these animals along with precautions to avoid confrontational encounters is the key to coexist with them with minimal mishaps. With the growing population of leopards in the park as well the ever-increasing pressure of the human population of suburbs around the park, this becomes even more vital to hold the fragile relationship of Mumbai's citizens and SGNP's leopards in good stead in the future.

The other lesser-known carnivores and omnivores present in the park include two species of elusive smalls cats: the Jungle cat and the Rusty spotted cat; two species of civets: the Asian palm civet and the Indian small civet; and two species of mongoose: Indian gray mongoose and the Ruddy mongoose. SGNP is also home to a wide array of herbivores such as the spotted deer, Sambar deer, Barking deer, Indian spotted chevrotain, Wild boar, Indian crested porcupine, Bonnet macaque, Black footed gray langur, Rhesus macaque and the Indian hare. It also has a wide variety of smaller rodents and many species of bats, most conspicuous of which are big colonies of the Indian fruit bat, one of the largest bats in the world. Many of these herbivores saw a population decline but the forest department has been relatively successful in boosting their numbers through introduction of new individuals into the park in the late 1900s and early 21st century. This can be seen for species such as Chital, Sambar and the wild boar. Out of the three monkey species, the bonnet macaque and the langurs are native and the most numerous. The Rhesus macaque is introduced and is restricted to only certain parts of the park such as the tourism area of Krishnagiri Upvan. Many of these Mammals are nocturnal and are seldom encountered. The best way to reliably observe mammals such as the civets, small cats, porcupines and the mouse deer is through setting up camera traps or waiting near sources of water during summers. Although, one can know of their presence through footprints, scat, scratch markings, etc.

The avifauna of the park can be described as typical of mixed deciduous forests of low-lying areas and foothills of western Ghats. Regularly noted resident bird species of the park include some of the very vocal birds like the Brown headed

barbet, Common Iora, Greater racquet tailed drongo, White rumped Shama, Crested serpent eagle, Rufous woodpecker, Grey junglefowl, various sunbirds, Jungle owlet and Indian scimitar babbler amongst various others. These birds breed and nest in the park and can be seen calling/singing throughout the summers. Around the early 1900s the park's population of Grey Jungle fowl has gone down alarmingly and only two doomed individuals were recorded. Hence in 1950, 3 cocks and 15 hens were released into the park by the forest department, hence saving this species from being lost. The pre-monsoons bring a special set of birds to the park. The park comes alive with calls of various different species of cuckoos that are looking to find a mate. On a good morning, one can hear around 7 different types of these brood parasitic birds vocalizing in the park. Birds such as the Indian Pitta, Pied crested cuckoo and the photogenic Oriental dwarf kingfisher migrate to the park at this time. The Oriental dwarf kingfisher comes here to nest and can be seen along various seasonal forest streams in the park, often detected by its distinctive high-pitched calls. One can also notice small numbers of the Shaheen Falcon, a scarce resident Peregrine, nesting in the higher reaches of the hills in SGNP. The months starting from late September bring a large influx of winter migrants in the park. A plethora of warblers and flycatchers, many of which have summered in the Himalayas can be seen in the park. SGNP has a very large diversity of birds of prey, many of which are winter migrants too. The most commonly seen ones include the Greater spotted eagle, Booted eagle, Eurasian Kestrel, Black eared kite etc. A few waterfowl have also been observed utilizing the lakes of SGNP during the winter migration.

There are many species of snakes and lizards that can be seen well during the monsoons in the park. They stay well hidden in the lush growth and one must have a keen eye to detect their presence. It is not very uncommon for people to miss an 8 feet long Indian rock python lying motionless in the undergrowth right beside a forest trail. Form the tree dwelling masters of camouflage like the Long-nosed vine snake (*Ahaetulla oxyrhyncha*) to the large agile terrestrial generalists like the Indian rat snake (*Ptyas mucosa*), snakes come in all shape and form to fill particular niches in the city forest. Commonly sighted snakes of the park include species such as the Indian rock python, Checkered keelback, Buff striped keel back, Common Bronzeback, Spectacled cobra, Bamboo pit viper, amongst others. During monsoons one can find the occasional Large

Scaled shield tail. A fossorial snake that stays burrowed during most of the year. The Indian monitor is one of the largest lizards in India with adults reaching to sizes close to 175cms, they can be found in the park with relative ease in certain areas. Many other interesting lizards also inhabit the various habitats of the park such as the ubiquitous Oriental Garden lizard, the Deccan banded gecko, Roux's forest lizard, the recently split *Giris geckoella*, gigantic Spotted rock gecko, etc. Lots of endemism is observed in many of these species of reptiles. The Indian Chameleon, once a common sight in SGNP, has now essentially vanished from many parts of the forest. During late winters, around February one can see the forest floor come alive with juvenile skinks of the genus *Riopa* and *Eutropis*, scurrying around in the dense leaf litter. These must have hatched in September and are usually just a few months old. One can also observe the Indian marsh crocodiles or Muggers basking by the banks of the park's lakes. Rains bring out the amphibians of the forest. Streams and stagnant pools come alive with the calls of frogs. From the tiny Ornate narrow mouthed frog of the leaf litter, no larger than the nail of your thumb to the massive Indian bull frog that can grow as big as both of your palms, the forests of SGNP harbor all a great diversity of ranids. By the end of monsoons many pools of stagnant water are full of tadpoles. The caecilians are probably the most mysterious amphibians in the park. They are a group of legless vermiform amphibians of the family Ichthyophidae which appear like an oversized earthworm in the first glance, closer inspection would reveal a set of eyes which gives their actual identity away.

Out of the massive diversity of invertebrates found in the park the *Lepidopterans*, which are butterflies and moths, are the most noticeable. There are around 172 species of butterflies found in the park which also includes the Blue Mormon, the state butterfly of Maharashtra. The diversity of Moths in the park is even greater, with some moths that aren't even described till the species level. One can find some exceptional species of moths in the park including the elegant Moon moth and the colossal Atlas moth, a genus which contains the largest moths in the world. Massive termite hills are a common sight in the park. One can also notice balls like nests that have patterns resembling a roof of a *Pagoda*, these are the crafty nests of the acrobat ants, a highly defensive, eusocial arboreal ant. If one comes across a concentric maze of walls on the ground it can be safely assumed that they are the handy work of the harvester ants. What is visible is just the surface of

the nest, below the ground is an intricate subterranean palace with a network of tunnels connecting multiple chambers serving different utilities. All insect families are very well represented in the park but are quite poorly studied due to extensive diversity. Arachnids, especially spiders are also equally well represented. Massive, waterdrop-covered webs, big enough to trap birds, can be seen woven amongst the forest trees, shimmering with the monsoon winds, come august. These are the handiwork of the conspicuous and beautiful Giant wood spiders, the largest orb weaving spider of the park. These spiders start out really small at the beginning of the monsoon season and reach their full size by the end of it. Other common spider families of the park include- The jumping spiders of the family Salticidae, Wolf spiders of the family Lycosidae, Lynx spiders of the family Oxyopidae, Orb weavers of the family Araneidae, Crab spiders of the family Thomisidae, etc. In certain parts of the park, good population of the beautiful Indian violet terentula can also be observed. The Indian red scorpion (*Hottentotta tamulus*) is one of the few scorpions in the world with medically significant venom that can be found under rock in the rocky areas of the park. Freshwater crabs become extremely numerous during the monsoons and the forest trails such as Shilonda are usually teeming with them. Many species of stream dwelling and estuarine fish species are also known from the park.

Image 10 Image 11 Image 12

Image 10: Barking Deer: A shy, small and ancient species of deer known for giving its diagnostic loud barks at the slightest sign of danger, Photo credit: Shantanu Majumdar

Image 11: Bonnet Macaque: One of the common species of monkeys in the park, endemic to the park that are known to live in large troops with complex social structures, Photo credit: Shantanu Majumdar

Image 12: Jungle Owlet: A small diurnal owl who's far carrying call can be heard throughout the park, Photo credit: Shantanu Majumdar

Image 13: Vigors Sunbird: A small colorful nectarivore bird endemic to the Northern western ghats, often found in the open forests of the park, Photo credit: Shantanu Majumdar

Image 14: Shaheen Falcon: A resident subspecies of the peregrine falcon often seen flying around the hills showing off its arial prowess, Photo credit: Shantanu Majumdar

Image 15: Oriental Dwarf Kingfisher: A very colorful diminutive forest Kingfisher that is a monsoon migrant to SGNP, Photo credit: Shantanu Majumdar

Image 16: Verditer Flycatcher: A pretty Flycatcher that is a winter visitor in the park from the Himalayas, Photo credit: Shantanu Majumdar

Image 13

Image 14

Image 15

Image 16

The conflict between the city and the forest

As stated earlier, what makes SGNP so unique is that it is wedged between two bustling cities of Mumbai and Thane. This distinction has given the National Park a somewhat turmoil ridden history strewn with demolitions, litigations, conflicts, calamities and most importantly, loss of biodiversity. The perpetual human presence in and around the park over the years has been the bone of contention of a lot of complications since the very inception of the park. SGNP made out of stitching *inam* lands, private lands, villages and the catchment of the lakes together. This meant, even though it was being protected, the populations of tribals were not accounted for. As the populations of the city increased, landlords started leasing lands to immigrants which in turn started creating slum pockets. Hence at one point, the area protected for the preservation of biodiversity, had a population of tribals as well as immigrants living within its limits. As seen from the above predicament, it was inevitable that encroachment would become an inherent problem with the park.

In 1950, Krishnagiri national park notified protected forest under the Mumbai National Park Act, the population of Mumbai stood at 30,88,811 and the park had a

meager size of 20.26 sq.km. At the time of writing this article, the city's population has reached an astounding 2,06,67,656, approx. 7 times the 1950 figure and the park has also 107 sq.km under the more fortified pretext of being a national park under the Indian wildlife act. Mumbai that had started as just the tip of the peninsula had expanded northwards and become the metropolitan within a century, with an area of 4738 sq. kms. As seen from the numbers above, the challenges over the years for the management of this unique forest has only increased. Referring to the past, managing SGNP is not only managing the affairs of the forest's welfare but also the burdens of the populace of the city. Hence, policy making and implementation for the welfare of the forest has always been complicated. The never-ending need of human development juxtaposed by the undeniable need of biodiversity and green spaces shows us the global dilemma we humans are facing and it shows even better in the story of SGNP due to its strategic placement. The bias towards development and immediate human needs is apparent by the decrease in natural habitats in major cities across the globe.

As stated in the evolution of SGNP, the park reached what it is now in various stages. Over the span of its evolution, the city evolved with it too and in the process the boundaries of where the city ends and the forest begins, became blurry. Mumbai rose as a major trade center of the

time; the population grew exponentially due to migrants flocking in for employment and business opportunities. Poverty, lack of planning, loose enforcement of laws, ill-planned land acquisitions and political motives all gave rise to one of the biggest issues for the city's forest, encroachment.

It was during the 1970s when encroachment started to really show. There was an accelerated growth of illegal hutments inside the park that at one point reached an unfortunate figure of 78,000 to 80,000 hutments. This had disastrous implications on ecology as biodiversity couldn't cope up with the anthropogenic activities in the park. Pollution of all kinds was rampant around the settlements. Loss of soil cover and its compositional integrity, logging activities for firewood, introduction of pest species and man-made forest fires destroyed the biodiversity these encroached sites and other parts of the park. Quarrying was rampant in

the park. Factories were leased land close to the city forest. Such fragmentation caused changes in interactional and mating behavior in animals and a plummet in many large mammal's populations such as the Barking deer, wild boar, sambar, amongst many other species. Unchecked movements of people in the park cause many social problems like illegal brewing of alcohol in the park. This overlap of the city and forest culminated in violence and the high court had to intervene.

The Bombay Environmental action group's (BAEG) Public Interest Litigation (PIL) was what changed a lot of dynamics in the tale of struggles of coexistence between the forest and the city. The PIL and the following court ruling started a different chapter for SGNP,where wildlife conservation got a strong footing. They invoked the Wildlife protection act (1972), The Indian Forest Act (1977) and the Forest conservation act (1977) in the PIL, urging the court to order the eviction of all illegal encroachers and the demolition of all illegal structures in the park. It also asked that the encroachers were not regularized and given amenities. They were met with a resounding victory as the court gave the forest department a strong mandate to evict the encroachers from the park and relocate them outside. Many committees were also formed to oversee its smooth execution. The resultant situation for the management was a complex one. Although the court's ruling gave them resources, it also made them dependent on the cooperation of the various actors in the forest city's socio-political landscape. The eviction of the enormous amount of people and their resettlement were murky waters and caused a big deal of controversy. After the initial violent confrontation, the forest department successfully evicted 60,000 encroacher families. About 25000 other families were offered free resettlement by the government of Maharashtra. Directly involving the Nivara Hakk Suraksha Samiti (NHSS), an organization that safeguarded the interests of the slum dwellers from the very beginning, in the relocation scheme was an important juncture that made the process smoother. With the big encroachment problem more or less out of the way, the forest needed time to heal and the management could again focus on the direct welfare of the forest's wildlife. Although things are not perfect, the following years have brought some semblance to the city forest. It is imperative that with the growth in population of the city, along with the park management, we the citizens of Mumbai give our best to conserve this astounding gem that is Sanjay Gandhi National Park.

The importance of SGNP to the city of Mumbai

SGNP like other urban forests provides valuable ecosystem services, it provides a green getaway to Mumbai's citizens along with buffering air pollution, carbon sequestration in large quantum, oxygen release etc. It has the right foliage cover to provide apt habitats to various lifeforms including insects, birds, reptiles and mammals.

It is well established that the urban forests provide key ecosystem services, like filtering air and water, it binds communities and is a resource for water management. The forest is like a green oasis in the urban concrete and tar landscape. It also provides conducive refuge habitat to several visiting migratory species of fauna. Research has found that proximity to green space can be correlated with improved physical and mental well-being along with healthy lifestyles. Green areas like SGNP are therapeutic for the urban lifestyle fraught citizens. Urban forests like SGNP aids in building social networks and strengthening community efforts to protect and promote forest resources. Exemplary SGNP facilitates awareness and understanding between urban population and nature. SGNP can be a learning ground for urban children and the young populace to understand inclusive living with nature and other species. Moreover, urban forest getaways like SGNP facilitates sensitizing the population to the ecological requirements of other lifeforms. A wonderful example of mutual co-existence within the maximum city.

Forestry studies has unraveled that urban forest can be key to prevent genesis of climate change and also mitigate its impact. The urban forests like SGNP have faster rates of carbon sequestration than other thickets of forest cover in the urban landscapes. It has been noted that the presence of large trees as witnessed in forests in or around urban ecosystems facilitate communities inhabiting these areas to better deal with threats that are brought about by climate change. The do so by shielding the area in case of heat waves and thereby reducing the ambient temperature. Trees are also known to reduce flood risks, limiting ground level ozone and hence preventing their adverse effects. Bolstering such forests that are in close proximity to civilization is imperative as it not only mitigates the

consequences of human actions but also makes the ecosystem more resilient to environmental change.

Forest tribes viz. *Chena, Yeoor, Warli* tribes and so on of the western part of the park extract livelihoods from the forest resources.

Moreover, urban forests like SGNP can also be beneficial for the urban ecosystem. In particular, they can mitigate the heat island effect, improve the water infrastructure, intercept rainfall and surface runoff thereby maintaining the ground water tables. They are also responsible for abating erosion and sedimentation, enhance agricultural production in urban and peri-urban areas, and increase property values. SGNP is a green oasis in the metropolis Mumbai that phenomenally contributes by reducing air temperature, sequestering carbon, providing habitat for forest flora and fauna, and also protecting Mumbaikars from environmental hazards, such as pollution. It's a cluster of green, tranquility and wild in the midst of urban milieu, a rarity even amongst global examples. The Mumbai Climate Action Plan 2022 gives a 30-year roadmap of short term, medium term and long-term climate goals which includes urban greening and biodiversity. SGNP will be the master orchestrator in achieving some of the goals.

Conclusion

Sanjay Gandhi National Park is a highly valued urban forest in the Maximum city Mumbai, analogous to a green oasis in the teeming urban landscape. SGNP and IIT-Bombay's evaluation will certainly help in quantifying equity of the forest to the city and its dwellers. It will help the administrators to put forth a revenue generation model for the park's services, a catchment treatment plan and a carbon sequestration plan. Urban forests are a strategy all over the world to combat the ramifications of climate change, greenhouse gases and pollution. Mumbai's relationship with the park is similar to what corals of the Great barrier reef of Australia have with the algae. Without the nourishment from the algae all that remains of the coral is a white husk. Without SGNP our city will turn into something not much dissimilar. Mumbaikars are lucky to have the green wealth of SGNP which needs further nurturing and conserving. It can exemplify sustainable city living with inclusion of urban forests. We Mumbaikars should be committed to the wellbeing of SGNP and our City, Mumbai.

"Say NO to Single Use Plastics"

Image 17 Image 18 Image 19

Image 17: *Ahetulla oxyrynchha*: A long nosed vine snake, an elegant species of lowland forests and wooded areas, perfectly evolved to lead a life on trees, Photo credit: Shantanu Majumdar

Image 18: Deccan Banded Gecko (*Cyrtodactylus deccanensis*): A beautiful terrestrial gecko endemic to part of deccan and Northern western ghats, Photo credit: Shantanu Majumdar

Image 19: Spotted Rock Gecko (*Hemidactylus maculatus*): A large rock dwelling gecko commonly found in the caves and between rocky crevices in the park, Photo credit: Shantanu Majumdar

Image 20

Image 21

Image 22

Image 23

Image 20: The very interesting looking, snake mimicking caterpillar of the Great Orange Tip Butterfly (*Hebomoia glaucippe*) on a Maastodi (*Capparis sepiara*) shrub in the park, Photo credit: Shantanu Majumdar

Image 21: The loud calls of the adult Cicadas (*Lemuriana apicalis*) echo throughout the forest during the warmer months, Photo credit: Shantanu Majumdar

Image 22: Giant Wood Spider (*Nephila pilipes*) with an Asiatic Blood Tail Dragonfly (*Lathrecista asiatica*) prey: Giant wood spiders with their massive webs are found abundantly during late monsoon in the park, Photo credit: Shantanu Majumdar

Image 23: An Indian Red Scorpion (*Hottentotta tamulus*) mother piggy backing its offspring, a behaviour commonly seen in many arachnids which was observed in the rocky outcrops of the park, post monsoon, Photo credit: Shantanu Majumdar

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Sustainable Living: The Indian Landscape

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Abstract

With the drastic demographic shift towards an increasingly older population, ageism (or age-based discrimination) is a significant challenge that can impede sustainable development. Given this, it is imperative to take measures towards including this previously ignored segment. The present article delves into the demographic shifts, economic challenges, healthcare needs and changes in the psycho-social support system that can influence the elderly. Factoring in the unique cultural context of India as the backdrop, we highlight areas of concern that need to be addressed through policy changes and mindset shifts to ensure the inclusion and wellbeing of ageing adults.

Sustainable Living: The Indian Landscape

The 2030 agenda for sustainable development by United Nations seeks to realise human rights of all by setting up a plan of action towards a more balanced sustainable development. If sustainable development goals (SDGs) are to include all segments of the society and "leave no one behind" (United Nations Sustainable Development Group, 2022), it is essential to not only focus on vulnerable segments but more importantly to move away from treating certain sections as vulnerable. Achieving an integrated 2030 agenda hence must address exclusion of and discrimination against key population groups such as older persons on the basis of gender, disability and other characteristics. The issue of ageism notably cuts across several crucial and concurrent sustainable goals of reducing inequalities,

eradicating poverty, promoting dignity of labour, health, wellbeing and so on, necessitating urgent policy reform and action.

Over the past several decades global population trends have undergone significant changes with recent projections indicating an enhanced life expectancy of 74.5 years and 79.1 years for males and females respectively by the year 2050 (United Nations, 2019). Subsequently, the global share of elderly persons is expected to rise from the current 13.4% to 21.3% by 2050, flagging concerns on deficient policies and infrastructure for the inclusion of a rapidly growing elderly population (United Nations, 2017). While an ageing population paints an optimistic picture of enhanced longevity, at the same time it also presents unprecedented challenges with profound implications for society, health, and the economy.

Concerns on inclusion of the elderly are even more pronounced in India (LASI, 2018). With the baby boom demographic cohort reaching old age, apprehensions are intensifying about how the country will plan for and manage the changing population structure. As India is ageing much faster than previously believed, the care needs of its rising elder population are also escalating. While familial care has been foundational in care for the elderly in India, the sharp demographic shift of a rapidly ageing population coupled with the changes in living arrangement casts reservations on continued reliance on familial care and informal arrangements. With India witnessing a fast-ageing demographic ahead of its institutional readiness to address the evolving needs of elderly, the current system and infrastructure may be overwhelmed with disproportionate load on economic, health and social services. While a few civic bodies like BrihanMumbai and Kolkata Municipal Corporation (BMC and KMC) are beginning to plan for the well-being of ageing societies (Hindustan Times, 2012; The Indian Express, 2020), there is much to be desired, especially in raising awareness about the potential implications of drastic demographic shifts. In this pursuit, robust and synchronised scientific data may prove pivotal for planning and preparation in medical, social, and financial arenas for the rapidly ageing population of India. Moreover, potent data could play an essential role in relevant and evidence-based action plans for older adults and elderly care, serving as a key resource for policymakers and researchers across a wide range of disciplines. Thus, the scant ageing research and complex issues of the aged in India form the rationale

for the present brief's focus on calling measures beyond legislative frameworks towards acknowledging diversity in ageing, equity, and more importantly, a social inclusion model for enhancing the quality of life. Social inclusion is of paramount importance for the elderly as social isolation can prove critical for morbidities and consequently mortality. Social participation can alleviate risk of isolation through partaking in community activities like volunteering, educating the underprivileged, group hobbies, and other leisure activities. For people to age in an active and healthy fashion, social participation becomes crucial (Raymond et al., 2013).

Accordingly, the present brief lays out the context of India's demographic changes, detailing some of the significant challenges the demographic shift is posing in the interconnected aspects of socio-economic wellbeing and healthcare for the aged. The crucial elements discussed are demographic shifts that compound issues for the elderly, financial insecurity, changing healthcare needs, and structural shifts in the living arrangement of an ageing population. We conclude with a few pertinent measures to address issues plaguing the diverse aged population in India by highlighting emerging areas requiring systematic study and policy recommendations for protecting and promoting the rights of older persons. This may aid in timely action on the part of some of the key stakeholders, including government, private companies, researchers, and the general population.

Demographic shifts

India, the second-most populous country, is evidencing a unique demographic and health-related transition. The census accounted for people aged 60 and above as comprising 8.6% of the total population (Census of India, 2011). However, by 2050 this is expected to rise to 19.5% reaching 319 million, whereas the proportion of children is expected to decline to 18.5 % (United Nations, 2019). Present trends highlight an increasingly ageing population that will continue to steadily rise in the future. Rapidly declining fertility, high contraceptive use, delayed marriages and childbearing, improved health and lifestyle, and increasing life expectancy indicate growing vulnerabilities for the population now and in the future. However,

there is sparse awareness of potential public health needs, disease burden, as well as economic and social implications of an ageing population, presenting potential challenges in the present and future.

With an increase in ageing members, the old-age dependency ratio is also rising rapidly. The old-age dependency ratio indicates the proportion of people who are 60+ years per 100 people in the segment of 15 to 59 years and is expected to go up to 31.5 by 2050. Moreover, the nation must adapt rapidly, especially as ageing process and its pace are not the same across the country. There is disproportionate demographic transition across India's states, owing to demographic intersections posing challenges for socio-economic development across strata, cultural norms, and political contexts. As the single demographic component of age cannot fully determine how people are perceived, multiple demographic categories of gender and cultural background can interact with age to influence how people are perceived (Hall et al., 2019). Thus, elderly women may be more susceptible to economic instability, changing family structures, waning support for older members, and an overall lack of social as well as health safety net. Though the life expectancy has gone up, it has risen differently for males and females. The growing gap in life expectancy between the genders insinuates that the Indian elderly population will largely comprise of females. Gender differences are also apparent in employment status of elderly: "70% of older adult men and 35% of older adult women age 45 and above are currently working; among elderly age 60 and above, 50% of men compared with 22% of women are currently working" (LASI, 2018). Studies highlight that more elderly women live by themselves when compared to men, and that living alone in a susceptible state of health increases their vulnerability manifold.

Besides the elderly population is hardly a homogenous group, more so in diverse countries like India. The challenges of the younger-old when compared to the oldest-old can contrast considerably with respect to economic and social well-being, social and work participation, and perceptions of self-worth. This marked multiplicity calls for a wide-ranging understanding of several age cohorts within the ageing members so that suitable policies can be framed in a timely fashion. Hence, it is crucial for policymakers to contemplate various interacting demographic categories to address changing care needs of the elderly.

Financial insecurity

Several older adults are negotiating with the challenges of staying healthy and productive, attempting to break the shackles of stereotypical metaphors associated with the elderly. However, despite a certain degree of structural support, older workers in the labour force continue to face incidental or systemic ageism among other barriers at the workplace. Many firms endorse the early retirement of experienced workers and refuse to hire people above a certain age despite the increasing lifespan and corresponding surge in productive years. Prolonged lack of employment and want of income over a growing number of years, can adversely impact older adults' sense of purpose, belonging, and engagement (Abramowska-Kmon & Łątkowski, 2021). Besides the personal ill effects of retirement felt by the elderly, even organizations stand to lose out on experienced talent. Instead of releasing organizational members that are still productive, businesses can leverage older employees by upskilling them to cope with the rapid technological changes. Consequently, further research and deliberation are necessitated on optimal retirement age to facilitate contemporary organizations in formulating revised policies to accommodate changing demographics.

Much of the burden of elderly healthcare costs fall squarely on the households, where health expenditure by families with elderly members is often disproportionately high. With the government's limited social security mechanism, diverse elderly cohorts continue to remain a vulnerable segment. As much of the social security and pension coverage is limited to organised industry sectors and the public sector, many elderly are not beneficiaries under pension or gratuity schemes. Health care expenses remain a burden even for insured elderly, as insurance coverage for outpatient care or medical and drug needs is close to non-existent. This inevitably results in a double whammy with heavy out-of-pocket expenditure for the already financially unstable elderly. Overburdened households often tend to rely on extended family, relatives and friends for health spending, and some even resort to alternate medicine with short-term informal domestic help and care. Hence, a lack of stable income and lack of access to health insurance or other benefits render the elderly, financially dependent. Thus, administrations may be compelled to rethink their priorities to deal with rising

healthcare costs and provide for health insurance. Likewise, organizations may also need to take a long hard look at their present meagre health benefits and overhaul outdated policies to support and enable the ageing workforce.

Changing health care needs

Morbidity associated with non-communicable diseases (NCDs) among the aged accounts for a high proportion of loss in healthy and productive life years, often with a high incidence of rheumatism, vision challenges, diabetes, kidney problems, high blood pressure, digestive disorders, loneliness and so on. As morbidities increase with age, the elderly often bear the brunt of a higher rate of cardiovascular illness, bronchitis, and cancer. These acute conditions often require long-term treatment and care adding to the escalating burden of healthcare costs.

While about 68% of India's elderly live in rural areas, older adults who live in urban areas report illnesses at a higher rate than those who reside in rural areas, 34% compared to 27% (LASI, 2018). This may be owing to a lack of access to medical services, which may explain why rural areas have higher morbidity rates with more than 80% of the elderly who lack access to healthcare residing in rural areas (LASI, 2018).

Besides such medical conditions, the elderly often have to face other implications of ageing, which aren't necessarily related to medical treatment or care but have a profound impact on overall health and quality of living. These may often take the form of psycho-social concerns such as social isolation, loneliness or lack of companionship and other physical disabilities or constraints that usually accompany ageing. The prevalent stigma of ageing has become a psycho-social barrier coupled with health, financial and other living challenges. It is thus imperative for policymakers to ensure that the elderly have access to quality healthcare services across geographies notwithstanding the socio-economic conditions.

Changing family structure and psycho-social support

Besides health and economic challenges, the issues pertaining to elderly care also must be viewed from a sociological stance. India, a collectivist nation, is traditionally known to revere family as a micro-social unit meeting the needs of older or senior members. Likewise, global literature on ageing also notes the importance of families and family caregiving as the traditional backbone for elderly care (Spillman & Pezzin, 2000). However, modern-day families have gradually taken on a different nature, structure, and size without much deliberation on serving needs of the elderly. While the traditional joint family system and values of sneh-shraddha in India seem to have safeguarded the health and wellbeing of elderly in the past, the emerging modern-day nuclear family set-ups are posing emotional, social, physical and financial insecurity amongst the elderly. With economic and technological advancements, familial care for the elderly is witnessing a decline and the living arrangement pattern of elderly staying alone or with partner/spouse is on the rise.

Considering the heterogeneity in ageing across diverse demographics of the aged, the living arrangement of older persons can be seen as associated considerably with health, functional status, disability and, more importantly, caregiving patterns. Demographic shift, rural-urban migration, a decline in the support extended by younger family members and several other macro socio, political and economic factors have dwindled familial sources of care and support for older members (Krishnaswamy et al., 2008; Rajan & Kumar, 2003). There is a rising trend of children switching cities or countries resulting in diminished care and consequent adverse impact on the lives of older family members. This is usually the case with the Indian middle class, where children leave parental homes for higher education and/or better prospects of job and quality of life in other geographical locations. Therefore, increased mobility spanning regions and nations can also play a critical role in decreasing the role of family in care provision of elderly.

Moreover, the shifting societal trends towards deferred childbearing and increased participation of women in the workforce along with assumption of demanding roles will only further impact the availability, willingness and ability of potential

active family caregivers for the elderly. This, in turn, can affect the physical and mental well-being of the elderly. Hence, while several studies reinforce home-based care as the primary source of care for older adults (Prakash, 1999; Prasad & Rani, 2007), the current drifts suggest that elderly care may be more nuanced than previously thought and fraught with challenges.

Elderly respondents of LASI (2018) indicated a relatively low rate of satisfaction with current living arrangements, but seemed less likely to alter their living arrangement when compared with younger counterparts. Elderly in India cite living with spouse/partner and children as the preferred living arrangement. Despite this preference, 6% elderly and close to 9% of aged women live by themselves in India. Therefore, while co-residence with family, spouse, partner, children and or others may perhaps sound beneficial and familiar to several Indian elderly for expected and assured care especially in situations of disability, morbidity or hospitalisation needs, the current trend of elderly living alone or with partner/spouse is compelling elderly to rely on non-familial caregivers. However, just as in the case of familial caregivers, equally challenging is the availability of non-familial care. This is because there are considerable challenges in terms of scant caregiver workforce, overworked and underpaid current caregivers, quality of care issues, lack of formal and or sufficient knowledge and skills in caregiving, opining elderly care jobs as menial or less attractive and so on. Further, the extant scant ageing literature focuses heavily on medical and health-related needs overlooking the nuanced role of caregivers, especially on aspects related to caregiver type, capacity, and patterns for varied living arrangements, the limitations and requirements of elderly (Agrawal, 2012; Prakash, 1999; Prasad & Rani, 2007; Sudha et al., 2006). Beyond anecdotal evidence, functional needs, mental well-being, other care needs or patterns and living arrangements for older adults remain unclear.

Implications and future directions

Elderly population in India is estimated to expand to 319 million by 2050 (LASI, 2018). As India increasingly evidences enhanced life expectancy of older individuals, there is an amplified need for elder care, support and assistance to manage

their day to day living activities. Given the diverse challenges discussed above, several regions, especially less-developed settings, are functioning under a massive resource crunch. With the projected increase in the ageing population, it is clear that the changing needs and care for older adults will only surge, inevitably putting strain on the already overstretched system. This will have significant ramifications both at the micro and macro level. In this context, while capability and capacity building across varied arenas would help cater to an ageing population's current needs effectively, it is imperative to understand heterogeneity in aged-cohorts to strengthen the mechanisms and provision across social, health and economic support and care, from the future stand. If public policy, socio-economic structures and health sector priorities continue to remain ill-prepared to face the demographic shift, the dependency ratio of older adults on the population aged 15 to 59 will only surge in the coming years. As the elderly often face multifaceted challenges of availability, accessibility, and affordability of care provisions, ageism and consequent exclusion of older adults from mainstream public welfare initiatives will prove highly detrimental to Indian society. This necessitates timely intervention to avoid the unpleasant struggle over scarce and finite resources for the elderly.

As implications of the rapidly ageing demographic are far from avoidable, it is pertinent to formulate corresponding adaptive changes and innovations in health and socio-economic strategies towards addressing some of these challenges. This necessitates some pointers for the way forward, to help delineate a road map for better mechanisms covering the social, health and financial provisions.

With the nation being diverse & populous while relying on privatised resources, extant public welfare systems often prove inadequate. While familiar with its critical role in facilitating policy making and strengthening the present mechanisms of care provision, the government must focus on augmenting collaborative approaches involving multi-stakeholders which can help expedite the adaptation and change process towards transforming the elderly care landscape. Analysing the global context of care and comparative studies will also help draw some of the learnings along with implications from global care models paving the way forward. Further, with higher life expectancy, both government and private firms must consider retaining a mature workforce as it becomes

essential for the sustainability of the current pension system in India. The fast-changing demographic landscape is bound to be reflected in the workforce as well making it crucial to stimulate and nurture the careers of older workers as organizations face a not-so-distant future of an ageing workforce. Staying active and increasing working capabilities is known to yield better health outcomes. Blending experience that is gained through age with young talent would help benefit India's inter-generational workforce and organisations towards economic inclusion. This helps thwart a high dependency ratio and expectation of financial support from children with employers assisting in health insurance.

Among the elderly, 60+ in age, 62% of those who reported facing discrimination on a daily basis perceived age as the main cause of biased behaviour followed by socio-economic status. Furthermore, 14% of those who experienced discrimination indicated caste or religious affiliation as the cause with such instances being higher in rural areas (LASI, 2018). While policy and law can perhaps address discrimination and inequality based on age, it is more important to dispel stereotypes and misconceptions about the aged. Promoting generational diversity and enhancing the knowledge or educational activities will bring much needed awareness and innovative solutions. We call for measures that will restore and rebuild creative exchanges and collaborations across generations. These inter-generational ties will develop potentialities and address the diversity of late-life care needs beyond health and security of income. Policymaker's investment and attention shift to non-medical health and well-being of elderly, and subsequent formalising of support systems, can prove promising for social inclusion.

The older members often are provisioned in a variety of settings. With significant variations in needs and problems of elderly, especially according to their age, socio-economic status, health, living status and other such background characteristics, knowledge appropriate to elderly living arrangements, care requirements will prove relevant in aiding corresponding conversations, policy and action. Besides, it may necessitate an overhaul in living and caregiving systems and infrastructure towards long-term quality of life. Decentralised, bottom-up, evidence-based, inclusive, and informed policy instruments alone would allow for adaptive and dynamic governance mechanisms. Towards this,

investigating the future demographic structure and composition of the ageing population may help develop viable strategies for the welfare of senior citizens. Coordinated developmental programs can be designed across diverse states of India enabling need mapping, situational analysis of elderly, prioritization and development of actionable models which are gerontology inclusive. This aids in the development of a taxonomy of goals to be served for an ageing population. Moreover, as mentioned earlier, education permeates greater awareness and assists in rebuilding systems to cope with the unforeseen challenges posed by the demographic shift. This supports in proactive interventions and prevention focus for several non-communicable diseases, with lifestyle improvements subsequently reducing individual, institutional, and government health costs.

Technology is a potential game-changer for the elderly care system in India. While in the past, the family has been the primary source of support in later life, it is widely accepted that the use of technology by the elderly population has a beneficial effect on their quality-of-life sans adaptation stress. Technology is one of the vital priority areas for the Indian government, realising it will only aid in digital inclusion and tech-based solutions for challenges of several older adults. Providing technology solutions to enhance the quality of life for older adults in India is gradually ramping up owing to socio-economic transitions besides demographics. Technology solutions considering costs, usability, gender, and ease of adoption can prove promising for aged life course. For faster adaptation to changing needs of the elderly, assisted living solutions and remote care in terms of robotics, Internet of Things (IoT) integrative platforms are known to aid substantially, in monitoring health and well-being. Social robots as emancipatory technology for emotional support and as instruments of combatting loneliness can enable independence for the elderly. Thus, aiding older adults in access to technology can significantly improve their quality of life.

Conclusion

The growing ageing population poses significant ramifications for both the individual and the society at large. We outlined some of the current and future challenges of the aged population in India along with key prospects for promoting

equity and inclusion of the elderly towards an instituted coordination for effective governance models.

Taken together, the role of planners and policymakers of local government in India becomes pivotal in fostering the wellbeing of diverse aged populations to ensure their engagement with society. While local governments have a critical role especially in tailoring solutions to address the diverse needs of the elderly, participation of all members of society is also imperative. Therefore, engagement with diverse stakeholders in inclusive governance of elder care systems will aid in older adults serving as active agents of societal development towards sustainable development outcomes.

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Mainstreaming Sustainability Education: A Case from Architecture Education in India

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Abstract

As a concept, the holistic approach to sustainability has three pillars as its foundation and standing - environmental protection, social responsibility, and economic practice (Jagatramka, Kumar, & Pipralia, 2020). All disciplines considered in formal education cater to the understanding and application of these three pillars of building sustainability, and so does architecture. This article aspires to establish and re-emphasize the need to reimagine the curricula to promote and cultivate a sustainable mindset through an illustration of architecture education in India. In order to achieve this objective, the top twenty-five Architecture Institutes ranked through the National Institutional Ranking Framework (NIRF) of the Ministry of Education, Government of India were used. The different Programs in the field of Architecture and Courses taught therein were considered and analyzed to understand the current status of architecture education of the top-ranked institutes contributing towards sustainable education goals (SDG4). The analysis suggests that though the curricula address the concepts and principles of sustainable education through architecture education in the NIRF top twenty-five HEIs, the number of Institutes/Universities offering the number of courses are not sufficient enough to holistically address and cater to the SDG requirements. This case, however, establishes the argument in favour of the important role education should play in fostering sustainability, and embedding concepts into curricula and practice.

Background

Living in the Anthropocene, it would be egregious to not acknowledge the growing adverse human impact on the Earth, and not address its dire consequences with utmost urgency, something that makes it imperative for society to develop "sustainability citizens" (Wals, 2015), who understand the complex world they inhabit, and can speak up and join hands for positive change (UNESCO, 2015). That's where education could and should play a decisive role. Education has

an undeniable potential to ensure that sustainability orientation is effectively embedded in peoples' awareness, attitudes, and actions. Higher Education Institutions (HEIs) in particular have a significant role to play in the implementation of education for sustainability. They can influence local communities and wider society by serving as models for sustainability and enhancing the capacity of people to make informed decisions and demonstrate responsible actions. Today, more than ever, HEIs are challenged to equip their students with a sustainability mindset and empower them with the competencies to act as change agents to address the sustainability needs of society and bring about the much-needed transformational change in the world. They are increasingly expected to undertake active measures to promote sustainable development, whether through redesigning curricula, rigorously crafting learning outcomes, fostering innovative pedagogies and campus initiatives, and aligning themselves with the UN's Sustainable Development Goals (SDGs).

UNESCO has been spearheading Education for Sustainable Development (ESD) since 1992, which has been explicitly recognised in the 2030 agenda for sustainable development, adopted by all United Nations member states in 2015. The agenda enumerated the seventeen SDGs and called for forging global partnerships to achieve better and more sustainable peace and prosperity for people and the planet. The seventeen SDGs are: as follows: 1. No Poverty, 2. Zero Hunger, 3. Good Health and Well-being, 4. Quality Education, 5. Gender Equality 6. Clean Water and Sanitation, 7. Affordable and Clean Energy, 8. Decent Work and Economic Growth, 9. Industry Innovation and Infrastructure, 10. Reduced Inequalities, 11. Sustainable Cities and Communities, 12. Responsible Consumption and Production, 13. Climate Change, 14. Life below Water, 15. Life on Land, 16. Peace Justice and Strong Institutions, and 17. Partnerships for the Goals (UNESCO, 2017).

The target 4.7 of the fourth SDG is to ensure that "all learners acquire knowledge and skills needed to promote sustainable development, including among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and of culture's contribution to sustainable development" by 2030 (United Nations, 2015). This calls for mainstreaming sustainability education by evolving and offering

curricula, courses and contents that are aligned with sustainable development , implementing learning for the SDGs through modification in learning strategies, policies, programs, and ensuring that the body of knowledge on sustainable development created in the current times is effectively passed-on to future generations (Nevin, 2008). It's only when students are sensitized to the criticality and urgency of sustainable development, by way of thoughtful exposure to the diligently selected sustainability perspectives and practices right from the foundational to advanced level, they cultivate a sustainability mindset for a better tomorrow. The inclusion of sustainability in academic curricula not only enhances learners' awareness and attitudes toward sustainability (Sidiropoulos, 2014), but also the university's image and reputation. It is universally accepted that sustainable development education influences education content (Gatti et al., 2019), and is widely reinforced by numerous studies (Weiss and Barth, 2019). Therefore, it is not surprising that curriculum usually emerges as one of the important elements in almost all declarations for sustainability in higher education (Lozano et al., 2013), yet the adoption of sustainability in the curricula is limited to only some higher education institutions (Brodowski et al., 2019). Rider (2014) accentuated a wide gap between how education endeavours to address sustainability and SDGs and the work that needs to be done in this area. The gaps exist in higher education sustainable development policy, practice, and curriculum (Franco et al., 2019), which vary among educational fields (Brodowski et al., 2019).

This article asserts the inclusion of sustainability concepts in mainstream education (precisely all disciplines). With the inclusion and focus on interdisciplinary and multidisciplinary education coming to the fore, the educational space is undergoing changes, to a seemingly significant extent. Technology and Design are also facilitating this change. A good example is that of 'Architectural Humanities', which provides students the lens of different disciplines like History, Sociology, and Cultural Studies to facilitate a comprehensive understanding of issues at hand among the students (Santini, 2020).

The illustration discussed in the article draws from the discipline of Architecture. The rationale for the selection of this discipline is critical to the understanding of the main argument. The field of Architecture is related to different disciplines,

such as Sociology, Psychology, and Physics (Gucyeter, 2016) among many others. Architecture, as defined by Gucyeter (2016) is a "unique discipline that facilitates spatial solutions for human needs and has a fundamental responsibility to ensure a sustainable built environment...as a combination of creativity, scientific knowledge and technological innovation... Essentially a contested concept with a multitude of approaches, and sustainability is considered vital for architecture discipline."

Illustrative Case in Point: Sustainability Programs in Architecture

The Brutland report to the World Commission (United Nations) in 1987 defined sustainability as, "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". This is a movement about not only "protecting the interest of future generations" but also of the "earth's capacity to regenerate". This can be done by "integrating the principles, values, and practices of sustainable development into all aspects of education and learning" (Nevin, 2008). As a concept, the holistic approach of sustainability has three pillars as its foundation and standing - environmental protection, social responsibility, and economic practice (Jagatramka, Kumar, & Pipralia, 2020). All disciplines considered in formal education cater to the understanding and application of these three pillars of building sustainability, so does architecture.

Architecture is a popular discipline in contemporary times seeing enormous growth globally, and also among the Indian HEIs. It plays an important role in informing practices and policies of our times (see Sustainable Foundations: A Guide for Teaching the Sustainable Development Goals by the Manitoba Council for International Cooperation, 2020); in shaping up the civilization, infrastructure, and societies of modern times; and helping us learn from the past. Though there are challenges in integrating sustainability concepts into the curricula, the HEIs can contribute towards building sustainable societies and providing a base for many disciplines to appreciate and incorporate the principles and practices of sustainability in their respective curricula. Researchers have demonstrated the

role architecture can play as a discipline in teaching and fostering the concept of sustainability. For example, examining the place of sustainability in architecture education (Gucyeter, 2016); how architecture can play the lead role in the preservation of resources (Wright, 2003); consistent study and critical evaluation of concepts in architecture and their effect on society (Durmus, 2012); 'culture and social traditions' in the context of built environments and people (Darus, et al., 2009); sustainability, efficiency, and affordability; and the role and importance of vernacular architecture (Jagatramka, Kumar, & Pipralia, 2020).

Globally, Architecture is one discipline "responsible to envisage the built environment that should respond to the ecological biodiversity" through sustainable designs (Almeida, 2020). Many courses are recognized by UNESCO and encouraged as part of ESD. In India, the Government constituted the Council of Architecture (CoA) in the year 1972 "under the provisions of the Architects Act, 1972, enacted by the Parliament of India, which came into force on 1st September 1972. The Act provides for registration of Architects, standards of education, recognized qualifications and standards of practice to be complied with by the practicing architects". As of 2015, 423 institutions impart architectural education and give recognized degrees by the CoA, India. These include various NITs, IITs, autonomous institutions, and Universities/Deemed to be Universities are among them (CoA, as cited in the reference section). The Council prioritizes sustainable development-related concepts like "energy conservation, ecology, environmental pollution, urban renewals, rural settlements, and economic development at different levels"; and subjects like "Building Services and Equipment, Architectural History, and Climatology" in the recommended curricula (Vaish, 2016). The Council has mandated 70% of the recommended courses and kept 30% as an open slots to provide some room for customization.

Despite the growing interest, the concept of sustainability is subtly contested within the discipline. Santini (2020) in her research article discusses various reasons at length for the lack of prominence of sustainability concepts in architecture curricula, for instance, the fragmented and limited approach of certifications to sustainability, overlooking other problems to resource depletion, lack of consideration for vernacular architecture and its possible harmful effects, besides others.

Research Objective:

This article aspires to establish and re-emphasize the need to reimagine the curricula to promote and cultivate a sustainable mindset through an illustration of the architecture education in India.

Method:

In order to achieve this objective, the top twenty-five Architecture Institutes ranked through the National Institutional Ranking Framework (NIRF) of the Ministry of Education, Government of India were used. The best-ranked universities are known to have a sustainable vision towards establishing a culture of sustainability (Salvioni et al., 2017). The different Programs in the field of Architecture and Courses taught therein were considered and analyzed to understand the current status of architecture education of the top-ranked institutes contributing towards sustainable education goals (SDG4). The websites of the listed Institutes were reviewed to tabulate the information. Where the information was not available, Institutes were contacted to get the information. Some Institutes reverted and some didn't.

The listed institutional websites and other referred websites (for example, NIRF) are all available in the public domain for free access. The email written to the contacted institutions duly informed them about the nature of our request and that the data was required for our research study to be considered for publication. Thus, data obtained through public information or through institutions has been used for analysis and that which was not obtained through the proper channel was not considered for the study.

Analysis:

The data obtained has been analyzed for the information obtained through websites and correspondence with the respective HEIs. Table 1 depicts Programs Levels at which the related programs are offered in the top twenty-five Institutes (NIRF – India Rankings, Architecture 2021), and Table 2 depicts Programs, Courses,

and Course Type related to Sustainability in these HEIs. The tables are followed by their detailed analysis.

Table 1: Showing Programs Offered at Program Levels addressing Sustainability related Programs in the top twenty-five Institutes (NIRF – India Rankings, Architecture 2021)

S. No.	Institution	Program Name	Program Level
1	Indian Institute of Technology, Roorkee	None	None
2	National Institute of Technology, Calicut	None	None
3	Indian Institute of Technology, Kharagpur	Architecture and Regional Planning – Sustainable Built Environment	PG
4	School of Planning and Architecture, New Delhi	Master of Planning with specialization in Environmental Planning	PG
		Master of Architecture in Architecture Conservation	PG
5	Centre for Environmental Planning and Technology University	Master of Conservation and Regeneration	PG
6	School of Planning and Architecture, Bhopal	Master of Architecture Conservation	PG
		Master of Planning in Environmental Planning	PG
7	National Institute of Technology, Tiruchirappalli	Master of Architecture in Energy efficient and Sustainable Architecture	PG
8	School of Planning & Architecture, Vijayawada	Master of Architecture (Sustainable Architecture)	PG
		Master of Architecture (Architectural Conservation)	PG
		Master of Environmental Planning and Management	PG
9	Indian Institute of Engineering Science and Technology	None	None
10	Jamia Millia Islamia	None	None
11	College of Engineering Trivandrum	Master of Architecture in Environmental Design	PG
12	Lovely Professional University	None	None
13	Aligarh Muslim University	None	None
14	Birla Institute of Technology	None	None
15	BMS College of Architecture	None	None
16	Chandigarh University	None	None
17	Visvesvaraya National Institute of Technology	None	None
18	Faculty of Architecture, Manipal Academy of Higher Education, Manipal	None	None

S. No.	Institution	Program Name	Program Level
19	Thiagarajar College of Engineering	None	None
20	Maulana Azad National Institute of Technology	None	None
21	Chitkara University	None	None
22	Anna University	None	None
23	National Institute of Technology, Hamirpur	Master of Architecture in Sustainable Architecture	PG
24	Shri Mata Vaishno Devi University	None	None
25	M. G. R. Educational and Research Institute	None	None

Table 1 shows the top twenty-five Universities/Colleges/Institutes according to the 2021 NIRF ranking in the discipline of Architecture. The table demonstrates the number and nature of Programs offered by these HEIs that are directly related to sustainable development, which can aid establish the role that education provides in fostering sustainability (as per SDG 4). Most of these Universities/Institutes are offering either two (for example - School of Planning and Architecture, New Delhi; School of Planning and Architecture, Bhopal) or one Program (for example - Centre for Environmental Planning and Technology University; National Institute of Technology, Tiruchirappalli; College of Trivandrum; and National Institute of Technology Hamirpur). The School of Planning and Architecture, Vijayawada offers three Programs.

It is evident from the table that only eight Institutes offer specific programs dedicated to sustainability out of twenty-five. Ranked in third place, IIT Kharagpur will offer one related program that too in the future, which will be “Architecture and Regional Planning – Sustainable Built Environment”.

Interestingly, all these Programs are offered at the Post Graduate (PG) level and there is no Program related to Sustainable Development offered at the Under Graduate (UG) level. In addition, the programs that are offered do not seem to cover the entire spectrum of sustainability concepts and practices. Further, the top two Institutes do not offer any specific program dedicated to sustainability.

S.No.	Institution	Program Name	Program Level (PG/UG)	SDG-4 centered Course Name	Semester	Nature of the Course (Core/ Elective)
1.	Indian Institute of Technology, Roorkee	Bachelor of Architecture	UG	Introduction to Environmental Studies	I	Core
				Ethics and Self Awareness	I	Core
				Climatology in Architecture	II	Core
				Landscape Design and Site Development	IV	Core
				Society Culture and Built Environment	V	Core
				Sustainable Architecture	VII	Core
				Architectural and Urban Conservation	X	Elective
		Master of Architecture	PG	Ecology and Sustainable Development	I	Core
				Sustainable Built Environment	II	Core
				Energy and Sustainability	II	Elective
				Sustainable Materials and Techniques	II	Elective
				Policies and Regulations for Sustainability	II	Elective
				Architecture and Urban Conservation	II	Elective
		Master of Urban and Rural Planning	PG	Ecology and Sustainable Development	I	Core
				Rural Planning and Development	II	Core
				Environmental Planning	II	Elective
				Environmental Law and Economics	II	Elective
				Environmental Impact Assessment	II	Elective
2	National Institute of Technology, Calicut	Bachelor of Architecture	UG	Building Climatology & Solar Architecture	III	Core
				Environmental Studies for Architecture	III	Core
				Energy, Sustainability & Site Planning	IV	Core
				Sustainable Architecture	VIII	Elective
				Architectural Conservation	IX	Elective
				Environmental Impact Assessment	IX	Elective
		Master of Urban Planning	PG	Environmental Planning	II	Core
				Planning for Sustainable Development	II	Elective
				Environmental Impact Assessment	II	Elective
				Urban Design and Conservation	III	Elective
				Human Settlement and Climate Change	III	Elective
				Urban Renewal and Conservation	III	Elective
				Green City Planning for Sustainability	III	Elective
3	Indian Institute of Technology, Kharagpur	Bachelor of Architecture	UG	Environmental Science	I	Core
				Environmental Studies	III	Core
				Climatology and Solar Architecture	III	Core
		Architecture and Regional Planning - City Planning	PG	The Program is yet to start	TBC	TBC
		Architecture and Regional Planning – Sustainable Built Environment	PG	The Program is yet to start		
4	School of Planning and Architecture, New Delhi	Bachelor of Architecture	UG	Environmental Studies	I	Core
				Climate Responsive Design	II	Core
				Solar Active and Passive Systems	IV	Core
				Energy System and Renewables	V	Core
				Green Systems Integration	VI	Core
				Sustainable Urban Habitats	III onwards	Elective
				Environment Impact Assessment	III onwards	Elective
				Solar Design	III onwards	Elective
				Renewable Energy systems	III onwards	Elective
				Energy Simulations	III onwards	Elective
				Climate Change and Cities	III onwards	Elective
		Bachelor of Planning	UG	*Curriculum not available*		
		Master of Architecture in Architecture Conservation	PG	History and Theory of Conservation	I	Core
				Planning for Conservation	I	Core

				Integrated Urban Conservation	II	Core
				Conservation Philosophy	IV	Core
				Conservation Management	IV	Core
		Master of Urban Design	PG	None	None	None
		Master of Design (Industrial Design)	PG	Design for Sustainability	II	Elective
		Master of Planning with specialization in environmental plan	PG	*Curriculum not available*		
		Master of Planning with specialization in Housing	PG	*Curriculum not available*		
		Master of Planning with specialization in Regional Planning	PG	Housing and Environmental Planning	I	Core
				Climate Change and its Impact	II	Core
				Environment and Development	III	Core
		Master of Planning with specialization in Transportation Plan	PG	*Curriculum not available*		
		Master of Planning with specialization in Urban Planning	PG	Sustainable Planning and Development	II	Core
				Climate Resilient Urban Development	IV	Elective
		Master of Construction Engineering and Management	PG	*Curriculum not available*		
		Master of Landscape Architecture	PG	*Curriculum not available*		
5	Centre for Environmental Planning and Technology University	Bachelor of Architecture	UG	*Curriculum not available*		
		Master of Architectural Design	PG	Relating through concerns of Social, Cultural,	III	Core
				Architecture as Resources – Fundamentals of	I	Core
		Master of Conservation and Regeneration	PG	Structural Conservation	I	Core
				Architectural Conservation Studio	II	Core
				Ethics and Legislation	II	Core
				Case Studies in Conservation	II	Core
				Sustainability and Conservation	III	Core
		Masters of Architectural History and	PG	None	None	None
		Master of Landscape Architecture	PG	Field Ecology of Plants	I	Core
		Bachelor of Urban Design	UG	*Curriculum not available*		
		Master of Urban Planning	PG	*Curriculum not available*		
		Master of Urban Transport Systems	PG	*Curriculum not available*		
		Master of Urban Infrastructure	PG	*Curriculum not available*		
		Master of Urban Housing	PG	*Curriculum not available*		
		Master of Urban Design	PG	*Curriculum not available*		
6	School of Planning and Architecture, Bhopal	Bachelor of Architecture	UG	Ecology and Environmental Studies	I	Core
				Environmental Behavioral Studies	II	Core
				Climate Responsive Architecture	III	Core
				Energy Efficient Architecture	VII	Core
				Conservation	IX	Core
		Bachelor of Planning	UG	Ecology, Environment and Resource Development	IV	Core
				Sustainable Urban Development	V	Core
				Urban Renewal and Conservation	VI	Core
		Master of Architecture Conservation	PG	Authenticity and Integrity	II	Core
				History of Conservation	II	Core
				Heritage led Regeneration	II	Core
				Disaster Management of Cultural Resources	III	Core
				Conservation Practice in India and Abroad &	III	Core
				Global Practices for Heritage Studies	IV	Core
		Master of Architecture in Urban Design	PG	Ecology and Environment	III	Core
		Master of Landscape Architecture	PG	Landscape Conservation	II	Elective
				Wild Life Landscape and Management	II	Elective
				Green Buildings	II	Elective
				Energy Efficient Landscapes	III	Elective

				Environmental Impact Assessment	IV	Core
		Master of Planning in Urban and Regional Planning	PG	Housing and Environment	I	Core
				Sustainable Planning Practices	II	Elective
				Disaster Mitigation and Management	III	Core
		Master of Planning (Environmental Planning)	PG	Housing and Environment	I	Core
				Environmental Planning Studio	II	Core
				Climate Informed Settlement Planning	II	Core
				Environmental Policy: Law and Governance	II	Core
				GIS applications in Environmental Planning	II	Core
				Environmental Impact Assessment and Monitoring	II	Core
				Environmental Planning Studio-II (Urban Sector	III	Core
				Green Infrastructure	III	Elective
				Natural Resource Management	III	Elective
				Biodiversity Conservation	III	Elective
				Environment and Society	III	Elective
				Ecological and Environmental Analysis	III	Elective
				Environmental Economics and Project Appraisal	III	Core
				Ecosystem Values and Management	IV	Elective
				Environmental Networks: Communication and	IV	Elective
				Technology and Environmental Planning	IV	Elective
		Master of Planning (Transport Planning and Logistics Management)	PG	Housing and Environment	I	Core
				Sustainable Mobility	III	Elective
7	National Institute of Technology, Tiruchirappalli	Bachelor of Architecture	UG	Environmental Science	I	Core
				Environment and Behaviour	IX	Core
				Environmental Control and Design Workshop	VIII	Elective
				Energy Efficient Buildings	IX	Elective
		Master of Architecture in Energy Efficient and Sustainable Architecture	PG	Energy, Environment and Buildings	I	Core
				Building Science and Sustainability	I	Core
				Solar Passive Architecture	I	Core
				Assessment of Built Environment	I	Core
				Building Energy Analysis Studio	I	Core
				Green Architecture	II	Core
				Energy Efficient Landscape Design	II	Core
				Statistics for Environmental Design	I/II	Elective
				Environment and Behaviour	I/II	Elective
				Environmental Lighting	I/II	Elective
				Natural Ventilation	I/II	Elective
				Healthy Buildings	I/II	Elective
8	School of Planning & Architecture, Vijayawada	Bachelor of Architecture	UG	Environmental Sciences	II	Core
				Climate and Built Form	III	Core
				Energy Efficient Architecture	VI	Core
				Architectural Conservation	IX	Core
				Landscape and Ecology	VIII	Elective
				Green Buildings and Rating systems	VIII	Elective
				Sustainable Architecture	IX	Elective
				Architectural Conservation	IX	Elective
		Master of Architecture (Sustainable Architecture)	PG	Building Physics and Sustainability	I	Core
				Environmental Codes and Energy Ratings	I	Core
				Resource Conservation and Efficiency	I	Core
				Smart Materials for Green Buildings	II	Core
				Waste Management	II	Core
				Eco Cities	II	Core
				People, Environment and Buildings	III	Core

				Eco sensitive Accessories and Green Materials	III	Core
				Traditional Wisdom and Sustainability Concepts	III	Core
				Energy Efficient Landscape	III	Core
		Master of Architecture (Landscape Architecture)	PG	Ecology, Ecosystem Analysis and Field Ecology	II	Core
				Energy Efficient Landscape	III	Core
		Master of Architecture (Architectural Conservation)	PG	Architectural Conservation Studio	I	Core
				Introduction to Conservation, History and		Core
				Planning and Conservation		Core
				Architectural Conservation Studio II		Core
				Conservation and Heritage Management		Core
				Historic Construction and Material Conservation		Core
				Architectural Conservation Studio III		Core
				Disaster Management of Cultural Resources		Core
		Bachelor of Planning	UG	Planning and Management of Green and Open	V	Core
				Environmental Planning and Management	V	Core
				Environmental Impact Assessment	VII	Elective
				Planning for Disaster Management	VII	Elective
				Climate Change and Cities	VIII	Core
		Master of Environmental Planning and Management	PG	Habitat and Environment Planning	I	Core
				Urban Environmental Planning Studio	II	Core
				Environmental Monitoring and Assessment Tools	II	Core
				Theory of Environmental Planning and Design	II	Core
				Environmental Economics	II	Core
				Ecological Footprints Analysis	II	Elective
				Planning for Healthy Cities	II	Elective
				Regional Environmental Planning Studio	III	Core
				Environmental Impact Assessment Techniques	III	Core
				Human Settlements and Climate Change	III	Elective
				Environmental Planning Thesis	IV	Core
				Environmental Justice and Professional Practice	IV	Core
				Environmental Law, Policy and Governance	IV	Core
		Master of Urban and Regional Planning	PG	Habitat and Environmental Planning	I	Core
				Human Settlements and Climate Change	III	Elective
		Master of Planning (Transportation and Infrastructure Planning)	PG	Habitat and Environment Planning	I	Core
				Transport and Environment	II	Core
9	Indian Institute of Engineering, Science, and Technology	Bachelor of Architecture	UG	Fundamentals of Ecology and Environmental	II	Core
				Climatology	IV	Core
10	Jamia Milia Islamia	Bachelor of Architecture	UG	None	None	None
		Master of Architecture (Architecture Pedagogy)	PG	Humanities and Built Environment	I	Core
		Master of Architecture (Building Services)	PG	EIA Natural Resources	I	Core
				Plumbing and Solar Water Heating	IV	Core
		Master of Architecture (Healthcare Architecture)	PG	None	None	None
		Master of Architecture (Recreational Architecture)	PG	Ecology and Environment	I	Core
				Designing with Nature I	II	Core
				Zoo Design and Eco-Tourism	II	Core
				Designing with Nature II	III	Core
		Master of Architecture (Urban Regeneration)	PG	Integrated Territorial Urban Conservation	II	Core
				Integrated Urban Eco System Management	II	Core
		Master of Architecture in Ekistics	PG	Environment and Management of Natural Resources	I	Core
11	College of Engineering, Trivandrum	Bachelor of Architecture	UG	Climate and Built Form I	III	Core
				Climate and Built Form II	IV	Core
				Environmental Science for Architecture	VIII	Core

		Master of Architecture (Urban Design)	PG	Site Planning and Ecology	I	Core
				Environmental Planning and Development	III	Elective
				Sustainable Settlement Planning	III	Elective
		Master of Planning (Housing)	PG	Environmental Planning and Development	III	Elective
				Sustainable Settlement Planning	III	Elective
		Master of Architecture in Environmental Design	PG	*Curriculum not available*		
12	Lovely Professional University	Bachelors of Architecture	UG	*Curriculum not available*		
		Bachelor of Planning	UG	*Curriculum not available*		
		Masters of Architecture	PG	*Curriculum not available*		
		Masters of Planning	PG	*Curriculum not available*		
13	Aligarh Muslim University	Bachelor of Architecture	UG	Environmental Studies	II	Core
				Climate and Design	III	Core
				Architectural Conservation	IX	Elective
				Sustainable Architecture	IX	Elective
		Master of Architecture	PG	Ecology and Sustainable Development	I	Core
				Architecture and Urban Conservation	II	Core
14	Birla Institute of Technology	Bachelor of Architecture	UG	Climatology	III	Core
				Environmental Studies	III	Core
				Architectural Conservation and Heritage	VI	Elective
				Energy Efficient Architecture	VII	Core
				Sustainable City Planning	VII	Elective
				Urban Ecology and Environmental Planning	IX	Elective
		Master of Urban Planning	PG	Urban Ecology and Environmental Planning	I	Elective
				Urban Regeneration and Conservation Techniques	I	Elective
				Sustainable City Planning	I	Elective
15	BMS college of Architecture	Bachelor of Architecture	UG	Climatology	III	Core
				Environment Responsive Architecture	IV	Elective
				Culture and Built Environment	VI	Elective
		Master of Architecture Habitat Design	PG	Heritage Habitat: Conservation and Renewal	I	Core
				Future of Habitat: Critical Issues	IV	Core
16	Chandigarh University	Bachelor of Architecture	UG	Climatology	III	Core
				Green building and Rating Systems	VII	Elective
				Sustainable Cities and Communities	IX	Elective
				Architectural Conservation	IX	Elective
		Master of Architecture	PG	Ecology and Natural Resources	I	Core
				Sustainable Energy Efficiency	II	Core
17	Visvesvaraya National Institute of Technology	Bachelor of Architecture	UG	Climate Responsive Architecture	II	Core
				Environmental Studies	III	Elective
				Green Architecture	III	Elective
				Barrier free Environmental Design	III	Elective
				Environment Behaviour Studies	IV	Core
				Architectural Conservation	VIII	Elective
		Master of Urban Planning	PG	Climate Change and Disaster Resilient Urban	Odd	Core
				Urban Climatology	Odd	Elective
				Ecology and Environmental Planning	Odd	Elective
				Methods in Sustainable Urban Planning	Even	Elective
				Urban Microclimate Studies	Even	Elective
18	Faculty of Architecture, Manipal Academy of Higher Education, Manipal	Bachelor of Architecture	UG	Environmental Science	I	Core
				Climatology and Lab	II	Core
				Sustainability	VII	Elective (basic)
				Sustainability	VIII	Elective

				Sustainability	X	Elective
				Sustainability	X	Elective
		Master of Architecture in Urban Design and Development	PG	Sustainable Development and Climate Change	I	Core
				Sustainability	I	Elective
				Environment and Behaviour	II	Elective
				Sustainability	II	Elective
				Sustainability	II	Elective
				Environment and Landscape Design	III	Elective
19	Thiagarajar College of Engineering	Bachelor of Architecture	UG	Climate and Architecture	III	Core
				Environment Behaviour Studies	IV and above	Elective
				Environment and Architecture	II and above	Elective
				Sustainable Architecture	IV and above	Elective
		Master of Architecture	PG	Climate Change Adaptation & Resilience	I	Core
				Urban Renewal & Conservation	II	Core
				Urban Ecology	III	Core
				Sustainable Water Management	II	Elective
20	Maulana Azad National Institute of Technology	Bachelor of Architecture	UG	Environment and Ecology	I	Core
				Climatology	III	Core
		Bachelor of Planning	UG	Ecology, Environment and Resource Management	IV	Core
				Urban Renewal and Conservation	VI	Core
				Human Settlements and Climate Change	VII	Core
				Green Infrastructure	VIII	Core
				Sustainable and Resilient Cities	VIII	Core
				Environment Impact Assessment	VIII	Elective
		Master of Planning in Housing	PG	Environmental Planning	I	Elective
				Energy Efficient Planning	II	Elective
				Climate Change and Human Settlement	II	Elective
				Ecology and Resource Development	III	Elective
				Sustainable Planning Practices	III	Elective
				Solid Waste Management	III	Elective
		Master of Planning in Urban Development	PG	Ecology and Resource Development	II	Elective
				Urban Conservation	II	Elective
				Environmental Planning	I	Elective
				Sustainable Planning Practices	II	Elective
				Solid Waste Management	II	Elective
				Solar Energy Systems	II	Elective
21	Chitkara University	Bachelors of Architecture	UG	*Curriculum not available*		
22	Anna University	Bachelor of Architecture	UG	*Curriculum not available*		
		Master of Architecture	PG	*Curriculum not available*		
		Master of Architecture in Landscape	PG	*Curriculum not available*		
23	National Institute of Technology, Hamirpur	Bachelor of Architecture	UG	Climate and Built Environment	III	Core
				Energy Efficient Architecture	X	Core
		Master of Architecture in Sustainable Architecture	PG	Sustainable Architecture Theory and Principles	I	Core
				Fundamentals of Ecology	I	Core
				Energy Efficient Architecture	II	Core
				Architectural conservation	I	Elective
				Eco Cities	II	Elective
24	Shri Mata Vaishno Devi University	Bachelor of Architecture	UG	Climatology	III	Core
				Environmental studies	VI	Core
				Green Buildings	VIII	Core
				Energy Efficient Buildings	IX	Elective
				Energy Footprint of Built Environment	IX	Elective

				Environmental Management	IX	Elective
				Architectural Conservation	X	Elective
25	M. G. R. Educational and Research Institute	Bachelor of Architecture	UG	Climatology	IV	Core
				Energy Efficient Architecture	V/VI	Elective
				Recycling and Waste Management	V/VI	Elective
				Sustainable Planning and Architecture	VII/IX	Elective
				Architectural Conservation	VII/IX	Elective
		Master of Architecture (Construction Project Management)	PG	None	None	None

Table 2: Showing Programs, Courses and Course Type related to Sustainability in the top twenty-five Institutes in India (NIRF – India Rankings, Architecture 2021)

Table two depicts the courses related to sustainability, which may either be Core or Elective; the Semester in which they are offered; and that can be mapped to the SDG4, within the architecture program.

It would be interesting to look at the analysis evident from the information mentioned in Table two. To reiterate, there are no seemingly particular Programs related to sustainability at the undergraduate level. Most of the NIRF top ranked Universities/Institutes offers only Bachelor of Architecture (B. Arch.), except four Institutes/Universities that offer Bachelor of Planning as well (School of Planning and Architecture, Bhopal; School of Planning and Architecture, Vijayawada; Lovely Professional University; and Maulana Azad National Institute of Technology).

Programs offered at the post-graduate levels are mostly in the areas of Planning (for example Master of Planning; Master of Urban and Rural Planning; Architectural and Regional Planning – City Planning; Architectural and Regional Planning - Sustainable Built Environment; Environmental Planning), Architecture (for example Landscape Architecture; Master of Architecture in Energy Efficient and Sustainable Architecture; Master of Architecture in Ekistics; Habitat Design), Conservation (for example M. Arch. in Architecture Conservation; Master in Conservation and Regeneration), Design (for example Urban Design and Development; Environmental Design, Habitat Design), Transport (for example: Urban Transport Systems; Transport Planning and Logistic Management), Infrastructure (for example Urban Infrastructure), and Housing (for example Urban Housing). Jamia Milia Islamia, ranked at number ten offers several interesting M. Arch. Programs like Architecture Pedagogy, Building Services, Health Care Architecture, Recreational Architecture, and Urban Regeneration. This description

envisages that though there are some interesting Programs, not all Programs: a) address all the ESD requirements, b) are commonly offered in all Institutes or Universities; and c) have a lot of variation in how the Program is designed. It was also observed that the curriculum of some Universities, which are ranked and have Programs that can contribute to sustainable education curriculum, was not accessible. There was no information on the website and the authorities did not respond when contacted. The absence of that information can be a limitation of this study.

The table suggests around 64 Core Courses and 49 Electives on Sustainability and related concepts at the undergraduate level Programs whereas around 106 Core Courses and 80 Electives at the post-graduate level Programs. Courses offered by the different Schools of Planning and Architecture (SPA) stand out as the most contributing towards Sustainable architecture education in India's top ranked [for example – SPA New Delhi (UG Core=5, Elective=6; PG Core=9, Elective=2); SPA Bhopal (UG Core=8, PG Core=19, Elective=21); SPA Vijaywada (UG Core=7, Elective=6; PG Core=32, Elective=8)]. These are only examples from the analysis of the available data. These findings are therefore, indicative in nature. Most of the Institutes are offering a minimal of 5-6 sustainability-centered courses.

Courses offered at the undergraduate level can be grouped using sustainability-centered keywords (in order of prominence) such as Environment (for example Introduction to Environment Studies; Environmental Studies for Architecture; Environment and Behavior; Environment Impact Assessment), Climate (for example: Climatology in Architecture; Climate and Design; Climate and Built Form), Sustainability (for example Sustainable Architecture; Sustainability; Sustainable and Resilient Cities); Conservation (for example Architectural Conservation; Urban Renewal and Conservation), Energy (for example Energy, Sustainability, and Site Planning; Solar Active and Passive Systems; Energy Systems and Renewables; Energy Simulations; Energy Efficient Architecture; Energy Footprints of Built Environment), Green (for example Green Architecture, Green Infrastructure, Green Systems Integration), Design (for example Landscape Design and Site Development; Barrier Free Environmental Design; Solar Designs; Climate Responsive Designs), Ecology (for example Landscape and Ecology; Urban Ecology and Environmental Planning; Fundamentals of Ecology and

Environmental Pollution; Ecology, Environment, and Resource Management; Recycling and Waste Management;), and Built (for example Society, Culture, and Built Environment).

One course worth mentioning is Ethics and Self Awareness offered in the first Semester as a core paper at IIT Roorkee. This is the only Institute (as per the availability and analyzed data) offering this course. The course is specially mentioned because of the conceptual significance it holds in sustainable education. All social, cultural, and economic ideas can be fairly applied only through a good intention and just act. What makes things work in the long run are values, and anything devoid of value will not hold in the longer run. Therefore, this type of course needs to be a part of such curricula mandatorily.

Courses offered at the **post-graduate level** can be grouped using sustainability-centered keywords (in order of prominence) such as:

Conservation (for example Architecture and Urban Conservation; Urban Renewal and Conservation; Architecture Conservation Studio; History and Theory of Conservation; Integrated/Territorial Urban Conservation; Conservation Philosophy; Structural Conservation; Conservation Practice in India and Abroad & Professional Training; Global Practices for Heritage Studies; Wild Life Landscape and Management; Biodiversity Conservation; Heritage Habitat: Conservation and Renewal; Future of Habitat: Critical Issues).

Planning (for example Theory of Environmental Planning and Design; Environmental Planning; Regional/Urban Environmental Planning Studio; Sustainable Planning and Development; Planning for Healthy Cities; GIS Application in Environmental Planning; Technology and Environmental Planning; Cite Planning and Ecology; Environmental Planning and Development; Methods in Urban Sustainable Planning).

Environment (for example Environmental Economics; Environmental Law and Economics; Environment and Behavior; Environment Impact Assessment; Housing and Environment, Environment and Society; Environmental Justice and Professional Practice; Environmental Codes and Energy Ratings).

Ecology (for example Ecology, Ecosystem Analysis, and Field Economics; Ecological Footprint Analysis; Ecology and Sustainable Development; Ecology and Resource Development; Ecosystem Values and Management; Ecology and Environmental Analysis; Eco Cities; Eco sensitive Accessories and Green Materials; Integrated Urban Eco System Management; Ecology and Natural Resources).

Climate (for example Human Settlement and Climate Change; Climate Change, Adaptation and Resilience; Climate Change and its Impact; Climate Change and Disaster Resilient Urban Infrastructure; Urban Climatology; Architecture as Resources – Fundamentals of Climate Responsive Architecture; Climate Informed Settlement Planning; Urban Microclimate Studies).

Energy (for example Energy Efficient Architecture/Landscapes; Energy, Environment and Buildings; Solar Passive Architecture; Building Energy Analysis Studio; Energy Efficient Planning; Solar Energy Systems).

Sustainability (for example Sustainable and Resilient Cities; Sustainability and Conservation; Sustainable Architecture: Theories and Principles; Sustainable Mobility; Building Services and Sustainability; Sustainable Development and Climate Change; Sustainable Water Management).

Resources (for example Disaster Management of Cultural Resources; Natural Resource Management; Waste Management; Environment and Management of Natural Resources).

Green (for example Green Buildings; Green Architecture, Green Infrastructure, Natural Ventilation).

Built (for example Sustainable Built Environment; Assessment of Built Environment; Healthy Buildings; People, Environment, and Buildings; Humanities and Built Environment).

Design (for example Design for Sustainability; Designing with Nature; Environment and Landscape Design).

and

Policies (for example Policies and Regulations for Sustainability; Environmental Law, Policy and Governance).

Some unique courses worth mentioning are: ***Relating through Concerns of Social, Cultural***,***Economic*** (Semester III) offered by Centre for Environmental Planning and Technology University. This title covers the entire spectrum of the sustainability concept. Centre for Environmental Planning and Technology University also offers ***Ethics and Legislation*** (Semester II) and ***Field Ecology of Plants*** (Semester I). School of Planning & Architecture, Bhopal offers ***Authenticity and Integrity*** (Semester II) and School of Planning & Architecture, Vijaywada offers ***Traditional Wisdom and Sustainable Concepts*** (Semester III). These are all very relevant and significant concepts taught as core courses. However, it is important to note that only these respective University/Institute offers these courses (their frequency in the table is only 1).

The top three Programs from the top three Institutes do not seem to offer programs specifically catering to sustainability. Amongst those who do offer, the top three would be **(Table 2)**: Master of Architecture in Architecture Conservation, from the School of Planning and Architecture, New Delhi (NIRF ranking 4). SPA, New Delhi also offers another program - Master of Planning with specialization in Environmental Planning, but its curriculum is not available. Next, the Centre for Environmental Planning and Technology University with the Program - Master of Conservation and Regeneration; and further next, the School of Planning and Architecture Bhopal, which offers two programs related to sustainability and the school of architecture - Master of Architecture Conservation and Master of Planning in Environmental Planning.

The data as mentioned in the above table suggests that though the curricula address the concepts and principles of sustainable education through architecture education in the NIRF top twenty-five HEIs, the number of Institutes/Universities offering the number of courses is not sufficient enough to holistically address and cater to the SDG requirements. This case, however, establishes the important role education can play in fostering sustainability, embedding concepts into curricula and practice and the gap that needs to be filled in doing so.

Discussion and Conclusion

Nelson Mandela was of the view that "Education is the most powerful weapon which you can use to change the world". There is no denying that education can play a central role in fostering a sustainability mindset, and HEIs can act as a catalyst for the achievement of the SDGs. The existing body of knowledge is well placed to guide HEIs in adopting a sustainability curriculum (Weiss and Barth, 2019).

Despite evidence to the contrary, as demonstrated by the illustrated case of architecture education in India, the curricula, courses, and content HEIs are not remotely attuned to sustainable development. The programs offered in this discipline are faintly aligned with the SDG requirements, the number of elective courses that specifically cater to the SDG is meagre, and the sustainability-specific core courses are almost inexistent. To reiterate and as evidenced in the illustrated case, the concept of sustainability is subtly contested within architecture discipline, which perhaps can be attributed to the lack of prominence of sustainability concepts in the architecture curricula, for instance, the fragmented and limited approach of certifications to sustainability, overlooking the problems of resource depletion, inadequate consideration of vernacular architecture and its possible harmful effects, besides others (Santini, 2020).

HEIs, particularly in the architecture education, need to reimagine their programs and pedagogical praxis to promote learning for the SDGs. It is imperative that they, with intense earnestness, raise and respond to the question of 'what should their students learn? It is incumbent on them to adequately emphasize values and ethics in the classroom, which hitherto has been ignored (Corrigan, Dillon, & Gunstone, 2007) perhaps for want of encouraging policy frameworks (Wals, 2015). The CoA may like to reconsider the way it prioritises and embeds sustainability concepts in its recommended courses, which constitute 70% of the overall curriculum.

As the first step towards achieving the herculean task of mainstreaming sustainability education, HEIs, specifically the ones associated with the architectural space, must evolve their curricula around the cross-cutting key competencies and learning objectives for sustainability that are relevant to each

and all SDGs (UNESCO, 2017). The cross-cutting key competencies are considered important for learners of all ages worldwide and are perceived to be instrumental in achieving sustainable development. The table below enumerates and explains the key competencies.

Key competencies for sustainability (UNESCO, as cited in the reference section)

Systems thinking competency:	The abilities to recognize and understand relationships; to analyse complex systems; to think of how systems are embedded within different domains and different scales; and to deal with uncertainty
Anticipatory competency:	The abilities to understand and evaluate multiple futures – possible, probable and desirable; to create one's own visions for the future; to apply the precautionary principle; to assess the consequences of actions; and to deal with risks and changes
Normative competency:	The abilities to understand and reflect on the norms and values that underlie one's actions; and to negotiate sustainability values, principles, goals, and targets, in a context of conflicts of interests and trade-offs, uncertain knowledge and contradictions
Strategic competency:	The abilities to collectively develop and implement innovative actions that further sustainability at the local level and further afield.
Collaboration competency:	The abilities to learn from others; to understand and respect the needs, perspectives and actions of others (empathy); to understand, relate to and be sensitive to others (empathic leadership); to deal with conflicts in a group; and to facilitate collaborative and participatory problem solving.
Critical thinking competency:	The ability to question norms, practices and opinions; to reflect on own one's values, perceptions and actions; and to take a position in the sustainability discourse.
Self-awareness competency:	The ability to reflect on one's own role in the local community and (global) society; to continually evaluate and further motivate one's actions; and to deal with one's feelings and desires.
Integrated problem-solving competency:	The overarching ability to apply different problem-solving frameworks to complex sustainability problems and develop viable, inclusive and equitable solution options that promote sustainable development, integrating the abovementioned competences.

A word of caution is in order here, though. The concept of competence when reduced to piecemeal behaviours and their corresponding indicators, can overly promote prescriptions of behaviours over the active engagement that fosters learning to know, critique, make change, to care, and to be (Wals, 2015). The SDG specific learning objectives are another important consideration that must be

pursued with the cross-cutting key sustainability competencies. It's important that HEIs examine what key competencies they are enabling, in addition to the specified learning objectives for the SDGs relevant to them. It's equally important that they adopt the relevant learning objectives in totality i.e., they must consider all three domains viz., cognitive, social-emotional and behavioural, where "the cognitive domain comprises knowledge and thinking skills necessary to better understand the SDG and the challenges in achieving it. The socio-emotional domain includes social skills that enable learners to collaborate, negotiate and communicate to promote the SDGs as well as self-reflection skills, values, attitudes and motivations that enable learners to develop themselves. The behavioural domain describes action competencies" (UNESCO, 2017). HEIs must make provision for the assessment of the adopted learning objectives to ascertain whether their curricula, programs, and courses are contributing towards the achievement of the SDGs or not.

This article enumerates the importance of curricula in furthering the cause of sustainability education, which is challenged by a contrary belief that says that sustainability, being an ill-defined and ill-structured concept, cannot be taught. "Teachers can at best create environment that are conducive to the exploration of sustainability issues around climate change, poverty, food security, biodiversity", hence teaching sustainability is more of an educational design challenge (Wals, 2015). Hence, it becomes imperative for HEIs to exercise due care while selecting the topics, methods and approaches for each learning objective of the relevant SDGs. Creating fieldwork projects to develop hands on experiential based learning of sustainable concepts and practices, and sustainability related extracurricular activities can be embedded into the curriculum.

The mission howsoever elusive should not deter the stakeholders' weather policymakers, educational institutions, or educators to synergise and evolve strategies, policies, programs, curricula, and courses to create awareness and trigger actions for achieving sustainable development.

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Environmental Dimensions of Tribal Sustainability:
An Analysis of Belief Systems and Economic Status of Warlis and Dhor Kolis in Palghar and Thane District*

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"Our history is not written, it is drawn: we tell you stories, we tell you about our life."
– Divya Soma Mashe, the great international Warli Art painter.

I. Introduction

The tribal population also known as the indigenous community varies in terms of languages, cultural values, and socio-economic conditions in which they live. In India, the tribal communities are classified as Scheduled Tribes. The Scheduled Tribe are dependent on the forest for their variety of needs, including livelihoods, habitation and other socio-cultural needs. Their major source of income is based on agriculture and forest activities. The Scheduled Tribes (STs) of India are among the most marginalized groups in society because of their exclusion and socio-economic backwardness. In India, there are 104.5 million Scheduled Tribe people, or 8.63 per cent of the overall population, according to the 2011 census. In 2011, there were 10.5 million tribal people in Maharashtra or 9.35 per cent of the state's total population. Maharashtra, which makes up 10% of all STs in India, has the second-largest tribal population in the nation after Madhya Pradesh (Census Report 2011). The larger part of the tribals in India belong to nine states Madhya Pradesh, Maharashtra, Chhattisgarh, Jharkhand, Odisha, Gujarat, Rajasthan, Andhra Pradesh and West Bengal. The way of living and habitants of each tribal

community is exceptional and connected to the utilization of particular natural aids and work. They collect forest goods without rendering any impairment to the forest. The forest is the source of livelihood for indigenous people. Tribals use wild plants as medications and as source of income for their livelihood.

The lifestyle and tradition of each indigenous community are unique and are related to the utilization of particular natural resources and particular types of work. They have been collecting resources from the forest without causing any damage to it. The number of wild plants used as medicines by tribal groups contributes significantly to their livelihood and food security (Mahaprata and Panda 2012). In India, the financial exploitation of tribes by non-tribes and forest contractors has hampered their expenditure and income. Still, this kind of exploitation has been going on which is visible from their mass poverty, literacy, low level of urbanization, modernization, poor communication and extreme poverty conditions (Pawar 2015). This brings us to the aim of the research which was to study the environmental linkages between tribal societies and nature, to study and collect folklore, belief systems, and document stories and specific words used by Warli and Dhor Koli as well as study the impact of urbanization and globalization on expenditure and income of Warli and Dhor Koli tribes in the selected area.

II. Studies on interrelationship between Environment and Tribal Sustainability

Current environmental philosophers propose recognizing 'ecological wisdom' found in the different cultural traditions. Aldo Leopold's book *A Sand County Almanac*, in particular the important essay titled "The Land Ethic," in which Leopold explicitly asserted on the philosophical roots of the ecological crisis (New World Encyclopedia 2017), as well as Munir Hossain Talukder's book *Companionship with Nature in Asian Traditions*, reflect this viewpoint (Talukder 2019). Virginus Xaxa, a tribal expert, notes in "Empowerment of Tribes" that "tribes in India are not a homogeneous category. They differ greatly from one another in terms of the places they call home, the languages they speak, the physical characteristics they exhibit, the geographical terrain they call home, the ways they live, the

stages of development they are situated at, and the size of the community they represent" (Xaxa 2001, 205).

The tribe's main issues are poverty, lack of drinking water facilities, limited education, and outmoded agricultural practices. The position of the indigenous population can be greatly improved by the efficient implementation of government initiatives (Kulkarni 1980). Tribals in Maharashtra, which is one of the advanced states, have not benefited from its developmental schemes. The parameters like literacy, female literacy, level of urbanization, work participation, percentage of workers in the non-agricultural sector and sex ratio are very low for tribes in Maharashtra (Pawar 2015). Several development initiatives have been made by the federal government and state governments over the past five to six decades to better the socio-economic circumstances of the tribal people. However, tribal development is still present concern due to issues like poverty, land, and health, forced migration, and the impact of growing industrial and urbanization on people that live in forests. (Nithaya 2018).

The fundamental goals of tribal development are to foster sustainable development of the tribal community while preserving the distinctive identities and culture of these people and to guarantee an enabling ecosystem of equal opportunity for education, health, and livelihood. They must be integrated into mainstream growth, but attention to their socio-cultural identity's maintenance and sensitivity is also required (Upadhaya 2018). Tribals' lack of access to education has inexorably been linked by studies to their dismal economic circumstances and poverty. Agriculture, which is the main source of income for tribal people, is primarily conducted on terraces or through shifting cultivation, both of which have relatively low productivity. Children, therefore, play a significant role in the home, contributing either directly or indirectly to the family's income by helping with chores like grazing the family's cattle or collecting fuel and fodder. (Sujhata 2002).

The Warli worldview, in particular, contradicts our metropolitan logic and reason, as do tribal worldviews in general. "Their ideas of morality and rights are derived from nature. For instance, they refuse to milk a cow because they believe only the calf has a claim to the milk. A mouse also fights for their fair piece of the produce.

Nothing is accomplished in a vacuum. The Warli world is one circular circle, not divided like other cultures. Their ceremonies, agriculture, folklore, and art all represent their awareness. Their Warli painting is a modest ode to life" (Tamarind Tree 2021). [1]

III. Research Methodology

This research was an attempt to study the belief systems and environmental practices comprising ecological wisdom and knowledge, social life, culture, religion, tribal philosophy, ancestral wisdom, folklore, economic features, faith, entertainment, rituals and festivals of the Warli and Dhor Koli tribes. The study was mainly based on primary data, which was collected by conducting intensive fieldwork in the Palghar and Thane districts of Maharashtra. The field investigators used the method of focused group discussion especially with understanding the philosophical belief systems and individual study method for obtaining data from the perspective of sociology and economics. For this study a questionnaire was devised and filled up in Palghar district of Maharashtra, under talukas of Mokhada and Jawar District out of which nineteen tribal villages were selected viz., Thakurwadi, Shivli, Phanaspada, Gonde khu, Ampepana, Tadyachapada, Sonarwadi, Dhamansheth, Ramwadi, Koshimsheth, Kavadpada, Sadakwadi, Loharpada, Durgaadi, Banachiwadi, Jamsar, Bedukpada, Sawardewadi and Poshera. While conducting the research various socio-economic characteristics comprising the following aspects: B.P.L. status, occupation, savings, debt, the income of the household, the status of the tribal sub-plan, housing facilities, toilet facilities, bathing, drainage facilities, electricity, fixtures and furniture, migration, educational facilities and health of the Warli and Dhor Koli tribes located in Palghar districts of Maharashtra were deeply investigated. It was observed that for the interview and focused group discussions a larger number of males were present as compared to females.

1 World of Warli, Tamarind Tree Project https://www.youtube.com/watch?v=uiECWsqlnK8, Accessed March 02, 2021.

IV. Observation of the Study

a. The Warlis and Dhor Koli Tribes of Maharashtra

The belief systems, practices, art, myths, narratives, ethos, and values of tribal villages in India have suffered due to the Eurocentric model of development. The research work focused on the Warlis and the Dhor Kolis tribes of the Sahyadri region of Maharashtra and we engaged with them to study their belief systems and environmental and economical practices so as to help us understand the intimate relationship that tribals share with nature as well as the moral and spiritual connection with nature. We also attempted to analyze the impact of urbanization and globalization on their daily life and decisions during the past few decades.

The Warli tribes are located mostly in the hilly tracts along the West coast in northern Maharashtra and southern Gujarat. This ethnographic study was made in Thane and Palghar districts where their largest numbers are found. However, they are also scattered through the adjacent areas, though in much smaller numbers. “The Dhor Koli have derived their name from the word dhor, meaning animal flesh, specifically the flesh of a cow. They are considered to be a low untouchable tribe. the Dhor Koli tribe suffer from the advent of poverty” (Kulkarni 2015, 47). In Thana they are concentrated in Mokhada and Jawhar. In Thane district, out of a total tribal population of 7,29,424 they constitute 3,23,791, with concentrations mainly in Talasari, Dahanu, Palaghar and Jawhar talukas.

b. The Philosophical Perspective

‘Nature is created by God and is omnipresent’ is the principal belief of the Warlis and the Dhor-Kolis. According to them, nature is all-powerful. If nature decides, creatures can be destroyed in a few moments. These tribes consider themselves to be Hindus. But now there is confusion among the tribals, they say that Hindus and tribals are different. Therefore, some people write their religion as tribal and some people as Hindu. Hirva, Khandoba, Bahiri, Bhavani, Mariai, Himaya, Kansari, Narayan Dev, and Waghya, are the gods associated with nature, as such, they are

asked to not believe in Maruti, Ram, Ganpati, or Shankar. Lord Rama is considered to be one of the Gods of the Warlis and Dhor Kolis. They remember their Lord and thus they greet everyone by saying 'Ram-Ram.' These tribes hold the Sun and the Moon in high esteem. The only God who is said to "show himself" is the Sun. Rain is regarded as a Pavasha deva since he aids in the growth of their crops.

The Waghoba or Waghya, Tiger God, is worshipped by the Warlis. He is the tribe's main deity. Every hamlet has a representation of the tiger deity in the form of a standing stone under a tree that is typically cylindrical in shape. In the ground, the stone is partially buried. In the case of the idea of the universe, however, these tribes are opposed to science. Many things in science are still not acceptable to these people. There is a deep influence (and belief in concepts) of the creation of the human race, God, demons, ghosts, and tantra-mantra on these tribes. They have an unflinching faith that their deities will protect them, so their emphasis is on serving these gods.

c. The Idea of Ethics and Morality:

Ancestral traditions seem appropriate to the Warli and Dhor-Koli tribes. The community does not readily accept outside customs and norms. According to them, if we break our ancestral customs and traditions, then the existence of our caste will be destroyed. They have a firm conviction that "all the customs in our society are right, they are the symbol of our tribe and that it is wrong to imitate rules and regulations which are external to our tribe." Thus, morality and righteousness according to the Warlis and the Dhor-Kolis is adhering to the ancestral norms and regulations.

d. The Idea of Nature and God:

The Warlis and Dhor-Kolis are convinced that nature and God are superior to human beings. It is evident from the fact that human beings have not been able to control air, water and fire till date. Nature and God are all powerful and have attained divinity. On the contrary, human beings are being punished for the degradation of nature. That is why erratic rains, floods, storms, and communicable diseases are on the rise. If it is not controlled in time, the destruction of nature is inevitable. Due to large-scale industrial production, polluted wastewater is discharged into the river, which worsens the rivers. The government and the

people are responsible for the increase in heat caused by the falling of trees and the decrease in the amount of rainwater. They are of the opinion that all the above is happening as the injustice done to God. The tribals have firm belief that since trees, water, animals and birds are deities in tribal religion, if they are preserved, protected, and increased in number, nature will change its approach towards the living and non-living species of the environment and the earlier days of happiness, abundance and wisdom will come again. For them, “Nature and God are not different. Nature is God and God is Nature.”

The oral tradition practised by the Warli tribe involves the transmission of knowledge through stories and songs to succeeding generations. In particular, their "Warli Paintings" demonstrate the Warlis' respect for nature. Their characteristic narrative paintings, which represent scenes that inform us about their beliefs and traditions, the rhythm of daily life, the cycle of the seasons, their joys and sorrows, are an integral component of this storytelling. It is a language that transcends words and uses visual communication, making it a useful tool for expressing stories that may span communities and continents (Garriock 2016). The Warli art is their language to communicate in story form about their lives and to portray their respect for nature and its creatures.

This study also documented the environmental vocabulary, vocabulary of objects, relations, customs, occupations, eating, dressing, religion, astrological words, days of the week, vehicles etc. of the Warlis and the Dhor-Kolis. From their vocabulary and interactions, we can make out their distinct naiveness which is quite different from that of the city folk.

e. Agricultural wisdom and rituals of the Warlis and Dhor Kolis:

According to the Warlis, the woodlands and their fruits appeared first. The woodland spirits are coveted, revered, worshipped, and have life for the Warlis. Their interaction with the forest spirits is a reflection of their ecological expertise. The Warli way of thinking contradicts urban logic and reason. "Their ideas of morality and rights are derived from nature. For instance, they refuse to milk a cow because they believe only the calf has a claim to the milk. A mouse also fights for their fair piece of the produce. Nothing is accomplished in a vacuum. The Warli world is one circular circle, not divided like other cultures. Their ceremonies,

agriculture, folklore, and art all represent their awareness. Their Warli painting is a modest ode to life." (Tamarind Tree Project 2021).[2] This itself demonstrates that tribal morality is non-anthropocentric. Animal ethics is what the tribals inherently value and function accordingly. It means the tribal belief systems function on the idea that there should be moral consideration of animals and they should be treated with respect.

The Warlis believe that conserving nature and taking care of animals is not an act of selflessness on the part of humans, but the only way to protect their own future and well-being. It was enlightening to note how the Dhor-Koli and Warli communities have developed a surprising set of eco-indicators, wherein they can predict the coming of the monsoon. Minute changes in sunrise and sunset and the cry of a particular bird, are messengers of the onset of the rainy season. A new cycle of life starts with the first rain in June. We were fortunate to witness the worship of wild vegetables after the first rain called Kovali bhaji.

f. Changing structure of marriage rituals

Among the ceremonies that the tribe performs the marriage ceremony is the most important. The marriage duration has been reduced from seven days to three days. The tribes follow old rituals and the groom's family offers new clothes, rice and a cash (minimum of Rs. 1500) to the bride. They cook mutton/chicken, wangi aloo, rice and tur dal and in sweets, they offer rice ladoo and bundi. There were few families which did not have sweet preparation in the wedding festivities. The minimum wedding expenditure is Rs 50 to Rs. 60,000. Relatives and neighbours do not help with cash but come to assist the family at the time of the wedding. A song sung in a wedding is narrated below:

Lagna (Marriage) Song:

सारे देव मंडपी आले, ये देवांच्या पडवळी बसल्या
पाची बोटे राम राम केला, दिला याला बसकर
ओढाया दिल्या भांगी तंबाखी
कहाण्या गोष्टी करू लागला (Personal discussion of the authors with Warlis, February 25, 2021, while interacting with them warlis, had sung songs).

2 World of Warli, Tamarind Tree Project, URL: https://www.youtube.com/watch?v=uiECWsqlnK8

g. Language

In many cases, both the tribes spoke Marathi and Hindi languages. Under the Warli tribes they do speak the warli language at their household level with their family. They were comfortable with the Hindi language as they migrated to other cities for work. Most of the tribes spoke Marathi and Hindi languages both covering 48% and some spoke only Marathi comprising 44% and the remaining 8 % spoke both Warli and Marathi languages out of 160 sample population. The Warli language demonstrates the effects of urbanization, cultural blending, and influence.

V. Economics Perspective

We observed that the living conditions of this tribal community are more like the people on or below the poverty line. Many families are nuclear with a minimum of 2 children. The majority of these families are residing in the villages for more than 50 years. The majority of the tribal population is engaged in agriculture and works as agricultural labour. Both husband and wife go to work together on the farmlands. Very few tribes have their land; a total of 90.63% of the tribe are engaged in agricultural labour. A very insignificant amount of labour is engaged in self-employment and service and it comprises 1.25 and 8.12% of the total sample tribal population. Limited tribes were employed under MNREGA programmers and had job cards for farm-related work, brick masons and factory work. Some have small shops that sell vegetables, and small ration shops and are self-employed. However, these labourers migrate for four months in a year as agricultural labour, which is the cause of concern for their children in the age group belonging to school-going age.

We studied their living requirements while observing their houses. The Dhor-Koli and Warli colonies are known as a wadi. The houses are impartial or rectangular sheds built on a coating of ground with or without a forum. The fabric consists of sticks, bamboo, wooden poles, and rice hay, mud and cow-dung plaster. This shows that they are dependent on natural objects for their houses without harming the environment. However, we found some of the houses were pukka houses indicating impact of urbanization. So, it is a mixture of very few techniques

of modernization but still having more dependence on nature for their living conditions.

A significant part of their revenue is expended on nutrition. The Warlis and Dhor-Kolis are non-vegetarian. Their eating habits are dependent on nature. They eat wild rabbits, goats, pigeons, and dry fish and their favourite non-vegetarian dish is chicken meat. They mix dal and dry fish and eat them with rotlas (stuffy nagli bread). Nagli and rice are their tack food. Rice is enjoyed with chutney. Pulse like urad (green gram), and tur (pigeon pea) are an important part of their diet. They start their morning breakfast with rice-gruel. During the winter season, they eat vora and wild roots. Besides these, they eat spinach and several green vegetables (raanbhajya i.e., legumes). Both the tribal members use palmolive and groundnut oil for making food. They brew liquor composed of mahua and molasses for their consumption and stockpile for others also. Seasonal fruits which they get from the forest are consumed occasionally. Using milk for the preparation of tea is very limited due to the non-availability of milk. Sometimes they use goat milk which has medicinal value for them.

It was observed that the majority of the tribes visited the government hospital but also used Ayurveda medicine for colds and coughs. Medicines were provided free in government hospitals but in the case of saline and stitches, the bare minimum amount was charged by the hospital. Many of the old members of the families were acquainted with the medicinal values of herbs from the forest and were using them for health issues. The small villages which we surveyed did not have appropriate health facilities, and the health centers had inadequate resources.

While checking the gender status we realized that though tribes follow matriarchy, the system is influenced by patriarchal norms. Women look after the entire household work. It is the female member who fills the water from the public tap and well and does all the household chores. They also contribute their help to agricultural lands. There was a difference of around Rs.50-100 concerning their payment. It was observed that most of the Dhor-Koli women were uneducated and gave a thumb impression instead of signing, whereas women in the Warli tribes were comparatively educated. However, the area has a poor literacy ratio.

The majority of tribes on average earns Rs. 150-200 for men and Rs. 100-150 for women and have worked most for 15 days of the month and remaining 15 days they are unemployed. The overall average income every month of both men and women is Rs. 4000. Out of this they spend Rs.175 as daily expenditure. The majority of their tribe spend more money on vegetable, liquor and tobacco consumption on a daily basis (Rs.30). They have tea without milk and spend Rs. 20 on tea and sugar. Snacks for their children, soap and washing powder consisted of Rs. 15 and 20. While surveying we noted that the majority of the respondents were not able to save because of their minimum income and many other expenses like liquor and tobacco. Most of their income is spent on daily expenditure and they are left with nothing to save. 89.38% of the tribal people do not have any savings amount. Out of 160 total samples, 10.62% of the population had saved a small amount of money.

They have other expenses as well like travelling to their workplace and other travels (Rs.20). Once a week they cooked mutton and chicken. They used Moha oil to cook food. The Moha tree is considered as 'Kalpavruksha' (tree of heaven) as it is very useful for its medicinal and economic uses in life.

Plate. 1.1 Waghya Deva

The social composition of both the Warli and Dhor-Koli tribes shows that the majority of the tribes' followed the Hindu religion. 1% of the tribal population visit church and are getting converted by missionaries into Christianity. Most of them were speaking the Marathi language and very few spoke the Warli language at their household level; there was no special language for the Dhor-Koli tribe. Marriage plays an important role in both tribes. All the important decisions were majorly taken by the married couple in the house. The oldest members were the head of the family irrespective of their gender. Marriage decisions were taken with the bride and groom's consent and arranged by their family members. The important festivals celebrated by both tribes were Koli bhaji, Shimga, Sedasad, Pitrapat and Goan Devi Utsav also known as Diwali and with a minimum of 20-25

with their community members, they celebrated their festival. They worshipped their deities occasionally and visited the temple, keeping fasts in the name of their god.

IV. Conclusion

“Nature is created by God and is omnipresent” is the principal belief of the Warlis and the Dhor-Kolis. They preserve their ancestral wisdom and ecological knowledge by following traditions taught and handed down from generation to generation. Both nature and the environment are interdependent. In their perspective, if nature is harmed, the environment will deteriorate and if nature decides, creatures can be destroyed in a few moments. Thus, Nature and God are one and the same, and both have tremendous power. They believe that animals and plants like human beings have a soul because they were created by God and it is the responsibility of human beings to protect and preserve the non-human species of the environment. They are of the opinion that it is morally forbidden to do things that are not in our religion. They have a firm conviction that “all the customs in our society are right, they are the symbol of our tribe and that it is wrong to imitate rules and regulations which are external to our tribe.” Thus, morality and righteousness according to the Warlis and the Dhor-Kolis is adhering to the ancestral norms and regulations.

The observances from field visits bring out key aspects. The tribes are more concerned about their subsequent generations' education, low transport installations, and further academic-related schools/colleges are located far away from their pada, resulting in a major deterrent to good education. In search of employment opportunities and good education, tribal families migrated from their pada to cities. The missionary activity is also noticed to convert families to Christianity, and still, on authorized documents, they show them as members of tribal communities. We also observed a few families call them Christan warli and others call them Hindu warli. Increasing urbanisation has bought remarkable changes in tribal people's lifestyles, including television sets, fridges etc.; yet women of the tribe's community need to walk miles to collect water from wells. The public health facility is located min 40-45km far away, this shows us low

health installation in tribal areas, giving an increasing number of health problems. Due to urbanisation their lifestyle, languages and consideration towards nature have changed. In earlier times, tribes used to use natural resources to celebrate their ceremonies and rituals but during our field visit we observed that they are influenced by urbanisation and have started using plastic glasses. Earlier, the tribal communities would make use of natural resources for different ceremonies and functions, but during our visits we noticed plastic glasses, thermal plates, and so on. Earlier, the tribal communities would make use of natural resources for different ceremonies and functions, but now they are influenced by urbanization and have started using plastic glass and paper. Today's generation prefers modern music like DJ in contrast to the Tarpa which is their time-honoured music during marriage rituals.

It was also observed that the area which we selected for our sample was about 150 km away from Mumbai and 60 km away from Nashik. Knowing the status of urbanization of Mumbai and Nashik, this area was expected to have some benefits of development in their socioeconomic progress. No doubt the penetration of progress happens but the degree of development was so poor that these habitats are living at least 50 years backwards. Rather the understanding and dependence on the nature of these tribes is minimized as they are dragged in the so-called 'economic progress'. The progress can be sustainable for these people if we incorporate their knowledge and try to have equilibrium with modernization techniques. We found there is a lack of actual implementation of most needed projects. Water resources development, soil conservation measures viz., bunding, tree platforms, specific programs for health and skill upliftment of men and women, better socialization area etc. are some of the programs suggested for the uplifting of these people here. The

Plate 2: Women carrying water for daily use, twice a day.

development will be sustainable only if these tribes are not de-rooted but they should be included according to their potential and capacity.

The present article is based on the final report of two tribal communities of Thane and Palghar districts submitted to ICSSR, New Delhi.

Plate 3: A tribal woman pressing Moha seeds.

Plate 4: Warli Art evolves itself to keep the community informed about COVID – 19

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REVIEWS

Book Review

Asha Hans, Nitya Rao, Anjal Prakash and Amrita Patel (edited) Engendering Climate Change: Learnings From South Asia 2022: (London & New York: Routledge. Pages 241. Price: INR 995.)

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Climate change is real, so are the vulnerabilities and threats associated with it. Between the two genders, female faces real challenge from the climate change. The book under review unfolds challenges, and problems rural and urban or semi-urban poor women face due to climate change. The significance of the theme this book has covered can be understand by the fact that of the 123 articles reviewed by A. Bunce and J. Ford (2015) on adaptation and vulnerability resilience research, only one focused on men, and none on other sexual identities (p 3). Despite the brunt of climate change women face, they are largely ignored to be a part of any policy-making process.

After Introduction (1-17), which is also chapter 1 of the book, Chapter 2 (19-37), Vulnerabilities of rural women to climate extremes: a case of semi-arid districts in Pakistan by Ayesha Qaisrani and Samavia Batool, focuses on rural areas of Dera Ghazi Khan and Faisalabad district. Even though average annual rainfall level has not changed much in Pakistan, the timings and rainfall patterns have changed (p 23). Such change affects a significant section of the country's population that

is highly dependent on timely rain for sowing seeds in the established agriculture season. In their fields of study-Faisalabad and Dera Ghazi Khan-the authors find the impact of climate change on women varies from one class to the other. Women in poorer socio-economic regions of Dera Ghazi Khan tend to be more vulnerable to adverse climate situations than those in slightly betteroff areas, such as Faisalabad (p 33). The authors also find that, even though older women have their say in household matters, crucial decisions related to adaptation, migration, and agricultural activities are taken by the male members (p 33).

Chapter 3 (38-57), "Gendered Vulnerabilities in Diaras: struggles with floods in the Gandak river basin in Bihar, India" by Pranita Bhushan Udas, Anjal Prakash, and Chanda Gurung Goodrich, explores the relationship between gender, perennial floods and male migration in the Diara region of Bihar. It is estimated that 73 percent of land and 76 percent of the population of Bihar are under perpetual threat of flood. Regular floods affect people's live and considered hurdle to the growth of the state (p 39). Diara is populated by the most marginalized social groups of Bihar (p 47). As there are not much employment opportunities available in the region, every year several men leave their village to look for work in various parts of India. Due to migration of a significant number of males from the region, burden to face the challenges from the flood rests on the shoulder of the women they have left behind. Despite the difficulties women face during the floods, at the time of distribution of relief packages gender becomes an important identity marker: gender discrimination also manifests in the government assistance programmes (p 51).

Chapter 4 (58-84) by Chandni Singh "Of borewells and bicycles: the gendered nature of water access in Karnataka, South India and its implications for local vulnerability" studies drought-prone Kolar district of Karnataka where use of technologies has pushed many into serious debts. In Karnataka, 27 of 30 districts, including Kolar, have been drought-hit since 2011 (p 61). The district faces an acute water crisis mainly due to the over-extraction of underground water. Regular droughts and unemployment have forced many males to migrate to major cities in search of job, leaving behind women in villages (p 73). To extract waters, most of the male-headed houses, use borewells, while most women-headed households depend on monsoon-season dry spells (p 73). Technology has not

changed the water situation in Kolar; it has privatized the commonly used water resources (p 79).

Chapter 5 (85- 105) "Vulnerabilities and resilience of local women towards climate change in the Indus basin" by Saqeeb Shakil Abbasi, Muhammad Zubair Anwar, Nusrat Habib, and Qaiser Khan studies- how climate change severely affects the health and wellbeing of many women. For instance, during the 2010 floods in Pakistan, the health of 713,000 women, including 133,000 pregnant women, were affected due to the lack of access to fresh water, infectious diseases, snake bites, and several other health-related problems (p 87). The authors have discussed the vulnerabilities of women in the Indus river basin which is divided into three zones: upstream, midstream, and downstream (p 85). In all three zones, climate change has enhanced their vulnerabilities and agency. Based on their study, the authors believe that women are adaptive and are capable of coping with the adverse impacts of climate change, despite having several social and cultural constraints on their mobility and participation in the decision-making (p 101).

Chapter 6 (106-124) "Climate change, gendered vulnerabilities and resilience in high mountain communities: the case of Upper Rasuwa in Gandaki River Basin, Hindu Kush Himalayas is written by Deepak Dorje Tamang and Pranita Bhushan Udas". This study examines gendered vulnerabilities to climate change as an interplay of external factors with the existing internal environment in Gandaki River Basin area (p 112). In this region, other than animals in transhumant herding, the women are primary caregivers. Women lacks cash in hand, despite the fact that they out-perform men by nearly 3.5 hours a day on an average (p 113). Although women are asked to do more works, they are paid two-thirds of what men get for the same work (p 114). Many men from the region have migrated for work in other countries. The women, left-behind, face challenges due to degrading environment without much of structural support. Unlike other castes, none of the Dalit families have opted for migration because they lack money to pay upfront (p 117). The level of vulnerabilities among women differs from one ethnic group and caste to others, depending upon class, age, educational qualification and geographical location (p 121).

Chapter 7 (127-151) by Divya Susan Solomon and Nitya Rao titled "Wells and well-being in South India: gender dimensions of groundwater dependence" is a study of impact of groundwater exploitation in some regions of Tamil Nadu. Tamil Nadu has only three percent of the total national water resources, making it one of the most water-vulnerable states in India (p 128). Rain deficiency has expanded groundwater irrigation in Tamil Nadu (p 133). Most of the well-off farmers in the state use modern technologies, but substantive number of medium and small farmers depend on their women for labour (p 134). Use of borewell has caused indebtedness among many of the farmers from the region. Indebtedness is disproportionately higher among small farmers belonging to Scheduled Caste (89.2 percent) and Scheduled Tribes (92.1 percent) (p 139). In the region, atomization of water ownership through borewells allows women to circumvent historical inequalities in access to water by invalidating the necessity to participate in male-dominated water user group; however, they are constrained by factors such as technology, knowledge and infrastructure (p 143). At social level, extraction and exploitation of groundwater have brought prosperity and emerged as an embodiment of economic aspirations and successful masculinity. But, in many cases, such prosperity has not remained for a long period. Failure of borewell has affected agricultural productivity and livelihoods, pushing people into "cycles of debt" (p 145). In such situation, women now invest more time to collect water from sources such as public handpumps (p 145).

Chapter 8 (152-171), "Gender, migration and environmental change in the Ganges-Brahmaputra-Meghna Delta in Bangladesh" by Katharine Vincent, Ricardo Safra de Campos, Attila N. Lazkar, and Anwara Begum is a study of migration from the region due to effects of climate change. In Bangladesh, there is a long-established seasonal pattern of migration from rural areas to urban regions for jobs (p 155). But climate change and climate-related environmental stress is likely to drastically change the magnitude and status of migrants (p 155). Most of the migrants are male. According to 2011 family survey data, only 8 percent of internal migrants to Dhaka and Chattogram, which accounts for 43 percent of total internal migrants, were women (p 158). There are also involuntary migrations in Bangladesh. It is estimated that every year approximately 60,000 people are made landless due to reshaping of the chars because of erosion. Bangladesh has faced 26 major

cyclones between 1970 and 2009, which have caused the displacement of around 650,000 people (p 161). Due to its physical location, Bangladesh will likely face more climate change-related consequences that will lead to more involuntary forced migrations.

Chapter 9 (172- 200), "Women-headed households, migration and adaptation to climate change in the Mahanadi Delta, India" by Sugata Hazara, Amrita Patel, Showik Das, Asha Hans, Amit Ghosh, and Jasmine Giri looks at the impact of climate change related phenomenon in the basin region. In 2011, the population of Mahanadi Delta was 8 million, a population density much higher than Odisha (270 persons per square kilometers) and India (382 persons per square kilometers) (p 175). The delta is vulnerable to natural hazards like recurrent floods, high-intensity cyclones, storm surges and coastal erosion (p 176). Such disasters cause large-scale damage to the region's infrastructure and affect agricultural activities. Due to such climate happenings, several people, especially males, migrate to urban Odisha, outside the state and out of the country, searching for employment. The migration of males makes women head of the household with decision-making powers. But the negative side of such migration is that only a handful of young males remain, which has reduced the community's ability to face climatic hazards and adversities (p 189). There are talks about adaptation. The Odisha 2010-15 Climate Change Action Plan recognized women's impact on water scarcity and reducing biomass but did not address the issue of adaptation (p 191).

Chapter 10 (201-225), "Gender dynamics and climate variability: mapping the linkages in the Upper Ganga Basin in Uttarakhand, India" by Vani Rijhwani, Divya Sharma, Neha Khandekar, Roshan Rathod, and Mini Govindan is a study of impact of climate change in the Himalaya region. Uttarakhand lies in India's highest seismic zone. The state is vulnerable to geo-hazards and exposed to many hydro-meteorological extremes because of its geographical location (p 209). In the last few years, Uttarakhand has witnessed many environmental disasters in which several people have lost their lives. Nonetheless, large-scale infrastructural work interfering with the nature continues. Despite being a water rich region, climate variability has intensified the state's competition for water and agricultural resources (p 213). There are differentiated impacts of climate variability within

gendered institutions. Differences manifest in unequal distribution of roles, responsibilities, and resources for men and women from different communities (p 223).

Chapter 11 (226-235) "Shaping gendered responses to climate change in South Asia" by Asha Hans, Anjal Prakash, Nitya Rao, and Amrita Patel summarizes what the editors had planned, and authors have attempted to say in their respective chapters. The three editors talk about three key insights that they say have emerged from their discourse on the gendered framework for climate change research. First, there is a need to pay attention to inter-and intra-household relations in research. Second, this study establishes an improved understanding of the gendered impacts of climate change and risk management through adaptative strategies undertaken by local communities. Third, the contributors in this volume have explored how vulnerabilities are gendered, and the agency is constructed, despite the existence of social and political barriers across the states of South Asia (p 226). The editors believe that the epistemological position of women in climate change research needs to be based on women's lived experiences. They feel that there is a missing link between research and policy-making. They believe that this study's empirical data could help inform policy and development professionals to implement gendered interventions (p 233).

Although the book is on South Asia, it misses chapter on Afghanistan, Sri Lanka, Bhutan and the Maldives. All the four countries are facing serious consequences of climate change. Second, individual chapters talk about migrations but many have not focused on how far change in the local environment due to climate change is responsible for such migrations. Third, also missing in this important volume is an answer or an attempt to answer a question: how environment-related displacement and other migration are causing conflict between the hosts and the migrant population? This conflict is mainly happening in cities where people coming from rural areas are seen as burdening urban resources and infrastructure. Finally, many of the chapters are unclear on how the regions and countries are trying to deal with the imminent threat. If they are, how effective are those infrastructures? Nonetheless, this book is a significant contribution to the literature looking at engendering climate change.

Book Review

"She Is" An Anthology Compiled by ElsaMarie D'silva

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SHE IS

This book review is of the book titled "She Is". It is an anthology compiled by ElsaMarie D'Silva and has illustrations by Supreet K Singh. It was published by Notion Press Media Pvt. Ltd in 2021 and is priced at 399 rupees.

This book is a compilation of stories of women advancing the sustainable development goals in India. 'Sustainable Development' is a habitual term for a student of geography. Also, as a student of gender geography, I am always in a search of learning more about the stories of empowering women. In my opinion, this book is at the exact crossroads of it.

This book has 33 stories of 33 women, each one comes from a different family culture, educational background and personal interests. What all of them have in common is this one thing: that they are passionately DRIVEN. Some had already chosen their purpose while some just found it along the way. They worked relentlessly on what they believed in, even when people around them did not. They made sure that they made themselves academically stronger, learning the know-hows of the world. They were thoroughly aware of the challenges that they had at their doorsteps. Keeping the big picture in mind, they came up with sustainable solutions.

When Sumaira Abulali noticed sand extraction at the beach near her house, she blocked the trucks carrying sand from there. She was attacked but did not give up. She became the first one to present the issue of sand mining at United Nations Convention on Biological Diversity. In 2020, the Government of India published Guidelines for sustainable sand mining. She says that no issue is big or small, we need to act on it.

When I read about her, I started looking if there is any illegal sand extraction taking place in my vicinity?

I salute Kamla Devi, a child-bride who defied all the rural customs and stereotypes and became the first and only woman solar engineer in her village. She didn't stop at that, she trained herself as a night schoolteacher as well. Today, she is training other men and women from her region.

We all try to help the poor when we see them. But one incidence in the life of Dr. Neelam Gupta triggered her to be a social entrepreneur. Simanteeni Khot and Richa Pant not only talked about the economic gap between the resource-rich and resource-poor but also became a big part of Corporate Social Responsibility themselves. They used their position as means to achieve substantial changes in the lives of the poor and gave meaning to the work done under Corporate Social Responsibility.

When I read the story of Bishakha Datta, author of "And who will make the chapatis?" who became the voice of women across India, taking down patriarchy, one brick at a time time.

I loved the story of Runa Ray who did not just study fashion and designs but came up with sustainable fashion styles from discarded surplus fabrics. Like origami, she experimented with zero-stitched techniques. She introduced ancient craft techniques in her collections to reduce carbon footprint of dyeing processes. She even came up with an incredible collection from her stroll on a beach!

We all travel and sometimes we come across the incidences of human-animal conflicts. Most of us turn a blind eye towards the issue. But Nayantara Jain, Lathika

Nath, Puja Mithra and Dr. Vidya Athreya worked persistently on creating awareness through their actions on the subject of wildlife conservation.

This decade for Sustainable Development Goals is the 'Decade of Action'. Every story in this book talks about action. There are 17 goals. each one laden with multifaceted obstacles. Though the goal is similar, there are diverse ways of approaching it. Some of these women picked up a particular goal like Eliminating Poverty or Hunger, or Having Clean water and Sanitation, or Renewable Energy, or saving Life under Water, Life on land and while some worked on multiple SDGs. What all these women have knowingly or unknowingly attained as their life choice is SDG 5: Gender Equality. They changed the views of their family members, colleagues and society on gender stereotyping. They questioned the customary status quos and dared to break them.

The stories are written by these women in their own words. They are short anecdotes that give an essence of their passion, struggle, successes and failures and most importantly a life message at the end. This, I feel is the beauty of this book. These stories are small doses of inspiration. One can just open any page and start reading and one can feel the positivity. These women give us hope, they give us strength, and a new perspective.

The illustrator of the book has added the introductory image of the storytelling woman and associated her endeavor with a relevant word. As we read the story, the image and the word builds itself around it, slowly building the picture out of puzzles. It is like mentally printing the entire journey of those women on paper. It was a novel idea!

It is not just a book with stories of 33 women. Every story is a life lived through difficulties. Every story is an approach, a methodology in itself. The compiler at the end has also compiled the strategies followed by these women to be advocate of Gender Equality and representative of Sustainability. It is done in the form of gripping quotes stated by these 33 women.

"At home: Encourage Equal Parenting – share in household work, childcare and earning an income; bring up sons and daughters equally – give them equal opportunities and equal responsibilities.

At Work: Pay and Demand equal salary for equal work." - Smita Mankad.

"Question the status quo" – Sohini Chakravarthy.

"Think minimalistic. Before buying or ordering, reflect if you really want it. Think again." - Shilpi Singh.

"No matter what your financial status is, the moment you resolve to take every measure possible to minimize your waste (be it energy, water, resources, material consumption), you would be living a sustainable life." – Anu Choudhary.

In conclusion, this book is extremely lucid. The initial part covers all the 33 fascinating stories. The flow of the content and the arrangement of the stories make it unique. In the latter part of the book, there are the 17 photos of sustainable development goals.

Under the section of Strategies to Advance Gender Equality, there are quotes by the women themselves, some of which are mentioned above. Finally, there is a list of non-Profit organisations where one can start volunteer work for the cause of their choice. The colours of The Goals of Sustainable Development reflect on the cover page of the book. However, except the cover page, the entire book is in black and white, including the images, possibly hinting at a metaphor used by the compiler to celebrate sustainability.

This book is for anyone and everyone who is empathetic towards the weaker sections of society and who emphasize sustainability in their lives.

OBITUARIES

A Rebel Without Pause- Sunderlal Bahuguna

(9th Jan 1927 - 21st May 2021)

Pratiba Naitthani

"Sunderlal Bahuguna" by Sandy & Alan

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I met Shri Sunderlal Bahuguna for the first time in 1999 in Tehri, Uttarakhand, where he was protesting against the construction of Tehri Dam. I was with my elder brother, Dr. Sunil Kainthola, who lives in Dehradun. We had gone to meet Bahuguna ji regarding a meeting we had organized in Mussoorie, to initiate as community rights movement- Vanaadhikar. This meeting was organized to bring the village communities of Uttarakhand, especially, tribal communities, environmental activists and like-minded organizations under one umbrella,- Alliance for People, to assert the traditional forest rights of the communities. The issue was closely connected with environment protection and the role of local communities in the same. And if we are talking about environment, especially in Uttarakhand, then Bahuguna ji had to be a part of it.

When people told me that he lives in a Kutia, (a handmade, basic hut), I brushed aside the information as an exaggeration because the last time I heard of someone living in a Kutia was Ram, Laxman and Sita, during their Vanvaas. But when we met him in Tehri, indeed his dwelling was a Kuita, at the edge of a bridge, where he lived with his wife, Smt. Vimla Bahuguna. There was no other habitat anywhere in the vicinity, nor were there any other people, just the two of them! The Kutia was a very basic, hand- made shelter, made of dry grass, with basic bamboo support, the floor was thatched with cow dung, with no facilities, whatsoever!!! I observed

Bahuguna ji, a frail man, who had become extremely weak due to the long physical hardships, but his aura was vibrant, his voice was full of determination and spirit was very high. He was very happy with the initiative of Alliance for People, but humbly excused himself, due to the protest to save Tehri. But ensured that one of his disciples participated in the meeting. We understood his point, he had to be physically present at the site to register his protest. He was kind to discuss the issue with us, gave us some very important inputs and valuable advice. Vimla ji also came and joined us for some time and shared her journey of awakening through associations and working with various prominent Gandhian activist who were working towards making a new India at the grassroot level. While discussing the anti-Tehri Dam protest, he did mention an accident which had taken place some time ago, in which a number of anti-dam activists died. According to him, rather than being a freak accident, there was a possibility that it could have been a Sabotage. 'After all, it is not easy to fight against powerful politicians, there are consequences of every struggle, some big some small!!' I couldn't believe my ears, because he spoke about a possibly planned conspiracy, which killed his fellow activists, without an iota of hatred or agitation!! He was calm, composed, sad about the loss and yet determined....Imagine, although he knew that protesting against the dam could be life threatening even for him, this threat did not bend him or break him, nor could it stop him, here he was a seventy two year old man with his wife, all alone, fighting against the mighty powers!! He was aware of the fact that with all its resources and muscles the hydro power projects could influence everyone, the politicians, unions including students union and other stakeholders.

After discussing the details of Vanaadhikar, we took his leave and went to the main Bazaar in Tehri.

After leaving from his Kutia, for a long time we were discussing Bahuguna ji. A Gandhian to the core, he spent his entire life taking up causes for the wellbeing of communities. He took Chipko Andolan, which started in Reni village, Chamoli district in 1974, to the world, he started movements for environmental protection, he spearheaded Anti Liquor movements, to create awareness about ill effects of liquor consumption, which even today is a

bane for Uttarakhand, and of course the Anti Tehri Dam movement.

He initiated the anti-dam movement when the protest was at its peak. About 100 villages in Tehri district, a habitat for around one lakh people, were to be displaced and there were mass agitations to protect the rights of people, to protect the environment and to save the geologically fragile mountains. Bahuguna ji; started leading the anti- Dam movement; after V D Saklani; fell seriously ill. Soon Bahuguna ji and the people from the hundred villages were on one side and surprisingly the villagers, - who were not getting directly affected by the dam were on the opposite side. The ones who were outside the displacement plan, were supporting the dam and were vehemently criticizing Bahuguna ji for taking an Anti-Development and anti-Pahad stand. They tried to vilify him and he was targeted consistently. He tried to make the picture clear to them, that the impact of such a huge dam would not end at merely displacing the 100 villages, there will be many indirect impacts, some visible, some not visible, some instant and some will start impacting after few years, but all of it fell into deaf ears. The villagers were displaced, hundred villages were vacated, the dam was built and those who were calling Bahuguna ji names, who declared him to be the villain of this anti dam protest, became the worst hit population. Those displaced were rehabilitated in New Tehri and in villages around, they were completely uprooted and had to change their way of living. But those who remained in the surrounding areas, are living in the back waters today. There is such a huge water body between them and rest of the region, that the distance which they could cover in a matter of couple of hours, now takes a couple of days!!!

The impact of huge water reservoirs created due to the dam on local climate is yet to be researched, however, there is a definite change in the rainfall pattern and increase in cloud bursts. Further, new disaster-prone zones on the periphery of the Tehri Dam are appearing and there is no science to probe the origin of this crisis. In due course of time couple of more villages might be forced to vacate while the civil engineering lobby keeps celebrating the positive impacts of the Dam in terms of minimizing the impacts of flashfloods. Bahuguna ji continued his protest relentlessly from the day he joined it in 1989, although, those displaced due to the dam, took the

compensation and left, those who got new land, took it and left, those who got construction contracts in the dam grabbed the opportunity to make some quick money, finished their work and they too left. In fact, the displacement process became an industry with Babus, politicians, middleman and real estate mafia joining hands to grab the prime lands allocated to the displaced families. But one man who remined there till the last day, till water reached his humble abode, till he had to be physically removed from the vicinity or else the flow of the dam water would take him along, was Bahuguna ji, he was there till 2001, not even for a day did he take a break, not even for a day did he rest or not even for a minute did he think of giving up. That is what he was, a man of conviction, grit, courage and selflessness.

We have seen many people carving out a carrier from the public protests, Chipko Andolan and anti-Tehri Dam protests were no exceptions. There were people, who projected to be the voice of the community against the policies of the government, but soon we saw them sitting with the very government, making policies for the same communities, for whose sake they were fighting with the government!!! Fake Gandhians in Khadi preaching swadeshi and presiding over big NGOs, some good but mostly fake. But Bahuguna ji never lost focus, nor did he get lured by a promising carrier of an Andolanjivi. He raised issues, pertinent to the communities, pertinent to Uttarakhand, pertinent to India and humanity, he stood by the principles he believed in and did not compromise with them at any point for his selfish gains. Rarely do we come across people like Sundarlal Bahuguna ji, who are selflessly dedicated to the wellbeing of others and continue serving others till the end.

The glorious history of Chipko and its relevance for native communities was in my mind when I decided to do my D. Phil on similar issues in Garhwal. There were few awakened souls like Bahuguna Ji, V.D. Saklani ji, Ghanshyam Sailani Ji and some others, who started the discourse on environment but now, the consciousness of Chipko is a global phenomenon. I dare to write that Sunder Lala Bahuguna is still alive through his dedication and contribution to save mother earth. In fact, he is becoming more relevant with each passing day!

“Bahuguna Lives”

Aparna Phadke

"Sunderlal Bahuguna" by Sandy & Alan

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Mr. Sunderlal Bahuguna's death came as a tragic shock to the entire world. A pioneer of environmental movements in India who taught the world to save the environment through nonviolent forms of protests. Himalayas, one of the most peculiar geographies and delicate systems had been experiencing reckless deforestation in 1960. The same invited frequent landslides, deluge and flash floods. The correlation between the rapid disappearance of the forests and increase in the number of natural calamities was proved by Bahuguna. Disturbed with the continuous degradation of Himalayan ecosystems, he initiated talks with the native people who voluntarily got involved in the Chipko movement to save their forests from reckless felling. The most vital element of Bahuguna's movements were the involvement of people, especially women. The people involved were from rural environments, may not have had great educational background, but were extremely passionate towards the Himalayas. So, it was a grassroot movement that challenged the very logic of 'development' and the idiom of 'Big is Beautiful'. His belief of "Ecology is Permanent Economy" laid the foundation of ecologically sustainable thinking.

Born on 9th January, 1927, he spent his entire life in Garhwal Himalayas. He lived for decades in his Silyara Ashram in Tehri, Garhwal, as he had decided to spent his life in rural settings. The Ashram was open to all, especially for the youth who were inspired by his courage and dedication towards environmental protection. Though he was known for his commitment towards the environment, he had also been a part of anti-liquor drive and was a strong supporter of abolition of social ills like untouchability.

He was an ardent Gandhian who believed in the principles of non-violence and continued to garner similar spirit into the environmental movements he led. Thus, Chipko movement emerged to be a guiding epitome for all the environmental movements that later emerged in India. He was against the construction of big dams as he strongly believed that construction of big dams in the Himalayas would adversely interfere with the fragile ecosystem and seismological balance. His staunch opposition to Tehri dam construction forced the government to emerge with several revisions in the original planning to reduce its environmental impact. Alas! in spite of a fierce opposition by him and many other environmentalists, the construction of Tehri Dam started in 1978 and was completed by 2006.

He believed that the solution of present-day problems lies in the reestablishment of a harmonious relationship between man and nature. While exploring on his understanding of development he proposes, "to keep this relationship permanent we will have to emerge with the appropriate definition of development. Development is synonymous with culture. When we sublimate nature in a way that we achieve peace, happiness, prosperity and ultimately, fulfilment along with satisfying our basic needs, we march towards culture". The definition given by him adheres to the intimacy between environment, society and culture keeping the communities at the core of development paradigms. This probably is one of the best definitions of sustainable development.

The real tribute to Mr. Bahuguna would be a caption as "Bahuguna Lives". I can see him alive in millions of people who are unnamed and believe in protecting their environments. Bahuguna was seen recently in those thousands of young people who gathered to protect Aarey forests, hugged trees and continued a fearless movement "Save Aarey".

The pandemic has taught us many lessons. People were starving for oxygen.... We know who can give us Oxygen free of cost. The real tribute to Mr. Bahuguna would be by strengthening our voices for "Rights of Nature". As one of the poets suggest, trees are our lives. Bahuguna still lives in those thousands of trees saved by him and his followers.

"Embrace the trees and
save them from being felled;
The property of our hills,
Save them from being looted"
(Mr. Ghanasyam Raturi, Poet, Chipko Movement)

CONTRIBUTORS' BIONOTES

Contributors

Captain (Dr.) Nitin Agarwala, a serving naval officer, has experienced various facets of a warship as a user, designer, inspector, maintainer, policymaker, teacher and researcher. He has authored over 80 articles, papers, book chapters and two books: Deep Seabed Mining in the Indian Ocean: Economic and Strategic Dimensions and Rise of China as a World Leader in Commercial Shipbuilding. His research interests include corrosion, shipbuilding, deep seabed natural resource, submarine cables, blue economy, artificial intelligence, climate change and "maritime technological issues" with their linkages to international relations and public policy.

Tiakala Ao is a General Manager in the National Bank for Agriculture and Rural Development (NABARD) and is currently holding the position of Officer-in-Charge of the NABARD Nagaland Regional Office, Dimapur. She holds a post graduate degree in Geography. During her 28 years of service, she has worked in various capacities in different Regional Offices of NABARD including its Corporate Office at Mumbai and has acquired rich experience working in various areas of NABARD's functioning particularly credit planning, micro finance, financial inclusion, rural infrastructure financing, refinance to Rural Financial Institutions, Institutional Development, farm sector development projects such as integrated tribal development projects, watershed projects, etc; Human Resources Management and research studies. Apart from her professional pursuits, her interests include dabbling in gardening, painting, interior design, travelling and reading.

Tithi Bhatnagar: is currently working as an Associate Professor and Deputy Director, Centre for Leadership and Change (CLC). She is responsible for Professional and Teachers Training Programs conducted at the Jindal Institute of Behavioural Sciences, O.P. Jindal Global University. She has trained around 7000+ teachers, students, Govt. Officials, and executives on topics like Understanding Stress, Stress Management, Performance Enhancement, Subjective Well-

Being, Multiple Intelligence, Work Life Balance, Effective Decision Making, Training Evaluation, and Motivation at Workplace. She is a psychologist by training and a Well-being and Happiness researcher and teacher by profession. Her doctoral research was in the area of Subjective Well-Being (SWB) from the Indian Institute of Technology, Bombay. Her research interests include Subjective Well-Being, Positive Psychology, Quality of Life, Happiness, Psychometrics, and Leadership.

Srikumar Chattopadhyay obtained M. Sc & Ph. D degree in Geography from the University of Calcutta, and completed P G diploma in Applied Geomorphology and Environmental Survey from ITC, The Netherlands. A Post-Doctoral Fulbright Fellow and recipient of Dr. S Vasudev award (1994) instituted by KSCSTE, Government of Kerala, and Prof. R N Dubey memorial award (2001) instituted by the Boovigyan Vikas Foundation, New Delhi. In 2013, he retired as Scientist G and Head, Resources Analysis Division, from Centre for Earth Science Studies, Thiruvananthapuram. After retirement he was awarded ICSSR Senior Fellowship hosted in CDS in 2015 and Fellow of the HWK Institute for Advanced Studies, Delmenhorst, Germany in 2016. He served as a Senior Consultant, of K-Disc, Government of Kerala in 2019 and is now ICSSR National Fellow at Gulati Institute for Finance and Taxation, Thiruvananthapuram. Dr. Chattopadhyay's work area mainly covers applied geography including participatory local level planning, and sustainable development. He served as visiting faculty in the Department of Geography and Environmental Studies, Montclair State University, New Jersey, USA; Leibnitz Centre for Tropical Marine Ecology (ZMT), Bremen, Germany and several other Indian Universities including Delhi, Calcutta, Mumbai, Burdwan, and Vidyasagar. He has completed more than 100 research papers, nine books, one Atlas and 45 research projects funded by the state, national and international agencies. At present he is co-chairperson of the XIV Plan preparation working group on Disaster Management and subgroup on Soil Survey and Landuse Planning, State Planning Board, Government of Kerala.

Lata Dyaram is a PhD in Organizational Psychology. She has held various roles in industry and academics. Currently an Associate Professor at Department of Management Studies Indian Institute of Technology, Madras, she teaches organizational theory, leadership and organization development. She has been a valued business partner for customised learning interventions in various industry sectors. Her current research and publication interests include employee voice and silence, diversity and inclusion; cognition, affect and behaviour in organizations. Her articles on these and other topics have appeared in

high impact scientific journals such as Journal of Business Research, learning and individual differences, international journal of productivity and performance management, employee relations, Equality, diversity and inclusion and so on.

Drishti Kalra: is a student in her third year of Bachelor of Arts Honours Psychology with a minor in Economics from Aryabhatta College, Delhi University. She is awarded as an academic scholar for her performance in college. She has also been awarded with academic excellence in the CBSE class 12 board examinations in her respective stream. Her interests majorly lie in the domain of Positive Psychology.

Nabila Khan is a graduate student at the Indian Institute of Technology Madras, India. Her research interests are employee voice, silence and organizational behaviour in contemporary Indian organizations.

Pravin Kokane: is Assistant Professor at Department of Geography, University of Mumbai with teaching experience of more than 8 years at post graduate level. Research professional with a Doctor of Philosophy (Ph.D.) focused in Economic Geography with special interest in food security from Savitribai Phule Pune University. He has published 11 research papers in national and international journals, co-authored six books on geography. He completed 5 research projects. His research interest lies in interdisciplinary research from Development, Urban and Population Studies. He has been a member of Geography Study Group in Textbook Bureau of Maharashtra for 11th and 12th standard.

Virendra Kumar joined the department of law in Panjab University as a Lecturer in 1967. He completed the Degree of Juridical Sciences (SJD) from the University of Toronto, Canada. Dr Kumar joined as Professor of Law at Punjabi University Patiala in 1979 and later joined the parent Panjab University (PU) Chandigarh as Professor in 1981. Thereafter Dean, Faculty of Law from 1984-87, Chief Editor Panjab University Law Review (1982-85), Fellow (nominated), PU. He was awarded UGC Emeritus Fellow in Law (200-2004) and in 2004, he had the privilege of being invited to contribute an article on the Hindu Law: Overview, to The Oxford International Encyclopaedia of Legal History (Oxford University Press, USA) published in multi-volumes in 2009. He has been invited to address the international conferences and he has to his credit 85 published papers. He is founding Director (Academics) Chandigarh Judicial Academy (2009-12) – an institution for training judges of subordinate judiciary for training judges of subordinate judiciary the

states of Punjab and Haryana, the Union Territory of Chandigarh; and member of the Three-member committee constituted by the Chief Justice of India under the Chairmanship of Justice KTS Thomas, Former Judge Supreme Court of India, for examining the functioning of the National Law School University, Bangalore (2008-2009).

Anuradha Majumdar, Dean of Faculty of Science and Technology, University of Mumbai, has more than 24 years of experience as an academician and scientist. She is B Pharm and M Pharm (Gold Medalist) from Nagpur University and PhD (Tech) from University of Mumbai. Majumdar's area of specialization is Pharmacology. She has been faculty in Bombay College of Pharmacy and her research areas is Neuropharmacology, Metabolic Pharmacology and novel drug delivery systems. Her research thrust is on "Mitochondrial Dysfunction in diseases and disorders". She has several patents, publications, book chapters and international presentations to her credit. Majumdar has successfully completed a significant number of Government sponsored projects including AICTE, BRNS-DAE, DBT-BIRAC, DBT, UGC Major etc. She is a consultant to Pharmaceutical and allied industries and has completed several industry sponsored projects. Recently her "Proof of Concept" on a drug delivery system platform has been selected by Cipla Ltd. in its Innoventia drive and taken up by the company for further development. She is the founding Director of the newly established Centre for Excellence in Maritime Studies.

Shantanu Majumdar has a BE degree in Computer Engineering from the University of Mumbai. Owing to his fascination for the flora and fauna, he favoured studying Biology all through his school life. He is not only an avid birder but an overall wildlife and nature enthusiast. In his free time, he travels to the various ecosystems that are tucked in small pockets of Mumbai city to observe the biota that inhabited them. Throughout these visits he has noticed the major anthropogenic pressure on these ecosystems and its inhabitants. Moreover, reading Salim Ali's phenomenal work 'The Fall of a Sparrow' further intensified his love for the biological realm developed my passion for bird watching and led him to understand the mannerisms of the natural world. Currently Shantanu is enrolled for the Masters programme in Environmental Science in the University of Auckland, New Zealand to add to the wind below his wings.

Pratiba Naitthani: is the Head of Political Science Department., St. Xavier's College, Mumbai. Her Ph.D. is on the issue of traditional Forest rights of Bhotiya Community V/S conservation policies of government. She has been studying Uttarakhand with special focus of tribal rights and contradictions in conservation and development policies of the government and its impact of the communities, issues related to women, ecology and environmental degradation, out migration, disturbance in peace due to community and state conflicts. Currently she is researching on Jammu Kashmir, focusing on political history, issues related to Article 370, impact of Article 35A, the problems of terrorism and separatism in Kashmir valley etc. She has written and presented several research papers on various issues related to politics, media, society, women and children. She spearheaded a campaign to make television safe for children and filed Public Interest Litigation (PIL) in Bombay High Court against Adult content broadcasted on television. She also was instrumental in getting the television regulation in place. She has filed several PILs in the National Green Tribunal to protect ecology and environment.

Namita Nimbalkar: Professor, Department of Philosophy, University of Mumbai has 22 years of teaching experience. She specializes in Gandhian Philosophy, Environmental Ethics, World Religions, Contemporary Philosophers – Indian, Plato and Metaphysics (Western). She has presented more than 80 research papers and published 25 research papers at national and international level. Her book "Gandhi's Quest for Communal Harmony" received the best book award by Bhartiya Mahila Darshanik Parishad in 2018. She has completed 5 minor research projects, awarded by UGC and University of Mumbai. She has completed Major Research Project awarded by IMPRESS, ICSSR, New Delhi entitled "A Study of Belief Systems and Environmental Practices of Sahayadri Zone tribes with special reference to Warlis and Dhor Kolis'. She is awarded Government of India's SWAYAM MOOC course on "The Moral and Social Philosophy of Mahatma Gandhi for 2021-22.

Bhagyashree Patil: has completed her graduation from Fergusson College, Pune in the subject of Political Science. She is a Post Graduate student of geography at the Mumbai University. She is currently studying Gender Geography and Geography of exclusion. She is an editor of digital book 'G se Gender' published by department of Geography.

Samruddhi Patwardhan: has done her Masters in Geography from Jabalpur University and Masters in Urban and Regional Planning from CEPT University, Ahmadabad. She is currently working as Program Officer at BVIEER, Pune and teaches courses on urban environment. She has an experience of 8 years in teaching Geography at graduate and post graduate level. She has also been a member of Geography Study Group in Textbook Bureau of Maharashtra and has been instrumental in writing and translating the geography textbooks. Her research interests mainly include urban water, sanitation, planning, environment, governance, and education.

Aparna Phadke; is Assistant Professor in the Department of Geography, University of Mumbai. She has been engaged closely in innovative methods of learning to Jilla Parishad School children. She is also engaged in wetland protection movement in the capacity of expert. Currently she is working on a research project sponsored by Indian Council of Social Science Research (ICSSR), New Delhi, IMPRESS on 'Urban Liveability'. She has Participated in national and international conferences and published in peer reviewed renowned national and international journals.

Mohammad Hashim Qureshi is an eminent scholar of Indian culture, religions, and development. He received his early education in Uttar Pradesh and University of Allahabad. He served as a faculty member in several universities of India (such as, University of Jodhpur, Jamia Millia Islamia, New Delhi) and outside the country as visiting Professor (University of Bremen, Germany; University of Adis Ababa, Ethiopia). He retired after a long service of 33 years (1975-2008) as Professor of Geography at the Centre for the Study of Regional Development (CSRD), Jawaharlal Nehru University, New Delhi. He has served the University Grants Commission and the Indian Council of Social Science Research in various capacities and have been members of various committees in other universities of India. He has published several books on various subjects, and the most relevant to the present context are 'Non-Violence in Gandhian Thought' (2011), 'Interfaith Harmony: An Essential Element of the Secular Fabric of India' (2011).

Amit Ranjan: is a Research Fellow at the Institute of South Asian Studies, National University of Singapore. He has authored India – Bangladesh Border Disputes: History and Post – LBA Dynamics. He edited 3 books, namely, Partition of India: Post-colonial legacies; India in South Asia Challenges and Management and Water Issues in Himalayan; South Asia: Internal Challenges, Disputes and Transboundary Tensions. His papers have been published in Asian Affairs, Economic and Political Weekly, India Quarterly, Indian Journal of Public Administration, Studies in Indian Politics, Social Change. He has also published short pieces in The Citizen, The Friday Times and The Wire.

Narayan Sharma is an Assistant Manager working in the NABARD Nagaland Regional Office in Dimapur. An Engineering Graduate by qualification, he has built interest in the field of Development Economics and Finance over the years. Currently, he is working in the area of Institutional Development of Rural Co-operative structure, where the focus is primarily on providing support for the organizational development of Primary Agriculture Credit Societies (PACS) as building blocks in the Co-operative Credit Structure of the state of Nagaland. He is also working for NABARD's Statutory Supervision of Rural Financial Institutions which includes State Cooperative Bank and Regional Rural Bank, where the primary goal is to strengthen the rural credit structure and to safeguard the interest of the depositors. Prior to working with NABARD, he had worked with Ministry of Skill Development and Entrepreneurship, Government of India as an internal auditor.

Tanushree Sharma: is a Professor & Director-Centre for Learning and Innovative Pedagogies, Jindal Global Business School, O.P. Jindal Global University. Her 20 years of professional experience spans across academics, industry, and consulting. Prof. Sharma has worked in Human Resources and allied domains at organizations such as Tata Projects, Delphi Automotive, USA, Punwire Mobiles, and University of Petroleum and Energy Studies (UPES). Prof. Sharma has a Ph.D. in Management from UPES. A Master Instructional Designer from ATD, USA, a six-sigma green belt, she holds certification in various domains from Stanford GSB Executive Education, Indian School of Business (ISB) and Richard Ivy School of Business, IIM Bangalore, and Harvard BPS. She has also undergone accredited work study programs offered by Carlton Advanced Management Institute, USA such as Certified Trainer and Facilitator, Certified Competency and Performance Developer. She has published her work and participated in conferences at national and international platforms. Her current areas of interest include capability building, employee engagement, performance management, organizational leadership and change.

Dave Sookhoo: (RN BA MEd PhD) is a health professional and educator based in the United Kingdom (UK). He holds academic degrees in social and behavioural sciences, education and health psychology. He has considerable experience in teaching research methods in undergraduate and postgraduate programmes and supervision of higher degrees student projects in health sciences. He has worked in the public and private health and social care sectors and continues to provide his services as a healthcare consultant. Dr Sookhoo has worked as an academic in UK universities, he is an active researcher and teaches global health and public health. His areas of research interest cover clinical, educational and psychological health and illness, with a cross-cultural leaning and low- and middle-income countries perspectives. He is a reviewer to journals and conducts systematic reviews. He is currently working of health systems and policies related to mental health in global health.

Medha Tapiawalla: Professor at Mumbai School of economics and public policy, University of Mumbai. She has 31 years of teaching experience. Public interest director at ICCL, BSE subsidiary since August 2021. She has completed one major project as Co-director, funded by IMPRESS, ICSSR, Delhi. She has also completed one minor project funded by university of Mumbai, one Consultancy project for shroff college. She has published 2 books, 20 papers and 8 chapters in edited books. Presented many papers and delivered many lectures as a resource person. Organised many seminars, workshops, short courses and refresher course in various sub areas in Economics. Conducted sessions on gender sensitization, financial literacy and independence for women, gender budget and on measurement of gender gap in development.

Style Guide

Citation Style: Author-Date Referencing System of *The Chicago Manual of Style* (Chapter 15, 17th edition)

Authors should adopt the in-text parenthetical Author-Date citation system from Chapter 15 of the *Chicago Manual of Style* (17th edition).

Some examples are listed below

1) BOOKS

REFERENCE LIST ENTRY:

Book references should be listed at the end of the paper as "Works Cited" in alphabetical order.

Single Author

Carson, Rachel. 2002. *Silent Spring*. New York: HMH Books.

Dual Authors

Adorno, Theodor, and Max Horkheimer. 1997. *Dialectic of Enlightenment*. London: Verso.

Multiple Authors

Berkman, Alexander, Henry Bauer, and Carl Nold. 2011. *Prison Blossoms: Anarchist Voices from the American Past*. Cambridge: Harvard University Press.

Anthologies

Petra Ramet, Sabrina, ed. 1993. *Religious Policy in the Soviet Union*. New York: Cambridge University Press

IN-TEXT CITATION:

References to the specific pages of the books should be made in parenthesis within the text as follows:

(Carson 2002, 15)
(Adorno and Horkheimer 1997, 23)
(Berkman, Bauer, and Nold 2011, 100-102)
(Sabrina 1993, 122-135)

Please refer to 15.40–45 of *The Chicago Manual of Style* for further details.

2) CHAPTERS FROM ANTHOLOGIES

REFERENCE LIST ENTRY:

Chapters should be listed in "Works Cited" in alphabetical order as follows:

Single Author

Dunstan, John. 1993. "Soviet schools, atheism and religion." In *Religious Policy in the Soviet Union*, edited by Sabrina Petra Ramet, 158–86. New York: Cambridge University Press

Multiple Authors

Kinlger, Samual A., and Paul H. De Vries. 1993. "The Ten Commandments as values in Soviet people's consciousness." In *Religious Policy in the Soviet Union*, edited by Sabrina Petra Ramet, 187–205. New York: Cambridge University Press

IN-TEXT CITATION:

(Dunstan 1993, 158–86)

(Kingler and De Vries 1993, 190)

Please see 15.36 and 15.42 of *The Chicago Manual of Style* for further details.

3) E-BOOK

REFERENCE LIST ENTRY:

List should follow alphabetical order. The URL or the name of the database should be included in the reference list. Titles of chapters can be used instead of page numbers.

Borel, Brooke. 2016. *The Chicago Guide to Fact-Checking*. Chicago: University of Chicago Press. ProQuest Ebrary.

Hodgkin, Thomas. 1897. *Theodoric the Goth: The Barbarian Champion of Civilisation*. New York: Knickerbocker Press. Project Gutenberg. http://www.gutenberg.org/files/20063/20063-h/20063-h.htm

Maalouf, Amin. 1991. *The Gardens of Light*. Hachette Digital. Kindle.

IN-TEXT CITATION:

(Borel 2016, 92)

(Hodgkin 1897, chap. 7)

(Maalouf 1991, chap. 3)

4) JOURNAL ARTICLE

REFERENCE LIST ENTRY:

List should follow alphabetical order and mention the page range of the published article. The URL or name of the database should be included for online articles referenced.

Anheier, Helmut K., Jurgen Gerhards, and Frank P. Romo. 1995. "Forms of Capital and Social Structure in Cultural Fields: Examining Bourdieu's Social Topography." *American Journal of Sociology* 100, no. 4 (January): 859–903.

Ayers, Lewis. 2000. "John Caputo and the 'Faith' of Soft-Postmodernism." *Irish Theological Quarterly* 65, no. 1 (March): 13–31. https://doi.org/10.1177/002114000006500102

Dawson, Doyne. 2002. "The Marriage of Marx and Darwin?" *History and Theory* 41, no. 1 (February): 43–59.

IN-TEXT CITATION:

Specific page numbers must be included for the parenthetical references within texts
(Anheier, Gerhards, and Romo 1995, 864)
(Ayers 2000, 25-31)
(Dawson 2002, 47-57)

For further details please see 15.46–49 of *The Chicago Manual of Style*.

5) NEWS OR MAGAZINE ARTICLE

REFERENCE LIST ENTRY:

List should follow alphabetical order and need not mention the page numbers or range. The URL or name of the database should be included for online articles referenced.

Hitchens, Christopher. 1996. "Steal This Article." *Vanity Fair*, May 13, 1996 https://www.vanityfair.com/culture/1996/05/christopher-htichens-plagiarism-musings

Khan, Saeed. 2020. "1918 Spanish Flu cure ordered by doctors was contraindicated in Gandhiji's Principles". *Times of India*, April 14, 2020. http://timesofindia.indiatimes.com/articleshow/75130706.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

Klein, Ezra. 2020. "Elizabeth Warren has a plan for this too." *Vox*, April 6, 2020. https://www.vox.com/policy-and-politics/2020/4/6/21207338/elizabeth-warren-coronavirus-covid-19-recession-depression-presidency-trump.

IN-TEXT CITATION:

(Hitchens 1996)

(Khan 2020)
(Klein 2020)

See 15.49 (newspapers and magazines) and 15.51 (blogs) in *The Chicago Manual of Style* for further details

6) BOOK REVIEW

REFERENCE LIST ENTRY:

Methven, Steven. 2019. "Parricide: On Irad Kimhi's Thinking and Being." Review of *Thinking and Being*, by Irad Kimhi. *The Point Magazine*, October 8, 2019

IN-TEXT CITATION:

(Methven 2019)

7) INTERVIEW

REFERENCE LIST ENTRY:

West, Cornel. 2019. "Cornel West on Bernie, Trump, and Racism." Interview by Mehdi Hassan. *Deconstructed*, The Intercept, March 7, 2019. https://theintercept.com/2019/03/07/cornel-west-on-bernie-trump-and-racism/

IN-TEXT CITATION:

(West 2019)

8) THESIS AND DISSERTATION

REFERENCE LIST ENTRY:

Rustom, Mohammed. 2009. "Quranic Exegesis in Later Islamic Philosophy: Mulla Sadra's *Tafsir Surat al-Fatiha*." PhD diss., University of Toronto.

IN-TEXT CITATION:

(Rustom 2009, 68-85)

9) WEBSITE CONTENT

REFERENCE LIST ENTRY:

Website content can be restricted to in-text citation as follows: "As of May 1, 2017, Yale's home page listed . . .". But it can also be listed in the reference list alphabetically as follows. The date of access can be mentioned if the date of publication is not available.

Anthony Appiah, Kwame. 2014. "Is Religion Good or Bad?" Filmed May 2014 at TEDSalon, New York. https://www.ted.com/talks/kwame_anthony_appiah_is_religion_good_or_bad_this_is_a_trick_question

Yale University. n.d. "About Yale: Yale Facts." Accessed May 1, 2017. https://www.yale.edu/about-yale/yale-facts.

IN-TEXT CITATION:

(Anthony Appiah 2014)
(Yale University, n.d.)

For more examples, see 15.50–52 in *The Chicago Manual of Style*. For multimedia, including live performances, see 15.57.

9) SOCIAL MEDIA CONTENT

REFERENCE LIST ENTRY:

Social media content can be restricted to in-text citation without being mentioned in the reference list as follows:

Conan O'Brien's tweet was characteristically deadpan: "In honor of Earth Day, I'm recycling my tweets" (@ConanOBrien, April 22, 2015).

It could also be cited formally by being included in the reference list as follows:

Chicago Manual of Style. 2015. "Is the world ready for singular they? We thought so back in 1993." Facebook, April 17, 2015. https://www.facebook.com/ChicagoManual/posts/10152906193679151.

Souza, Pete (@petesouza). 2016. "President Obama bids farewell to President Xi of China at the conclusion of the Nuclear Security Summit." Instagram photo, April 1, 2016. https://www.instagram.com/p/BDrmfXTtNCt/.

IN-TEXT CITATION:

(Chicago Manual of Style 2015)
(Souza 2016)

9) PERSONAL COMMUNICATION

REFERENCE LIST ENTRY:

The expression “personal communication” covers email, phone text messages and social media (such as Facebook and WhatsApp) messages. These are typically cited in parenthetical in-text citation and are not mentioned in the reference list.

IN-TEXT CITATION:

(Sam Gomez, Facebook message to author, August 1, 2017)

Notes should preferably be listed as endnotes, followed by a works cited/references column.

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