

## CARBON SINK: A TOOL TO ACCOMPLISH INDIAN CLIMATE GOALS

**Prateek Mishra \***

### ABSTRACT

*Carbon footprints have been a headache for decades now. Despite profound attempts during Paris Agreement towards achieving sustainability, we notice a lack of individual effort and a casual attitude toward adopting daily practices for limiting emissions. India's NDC regarding adding more carbon sinks and subsequently adopting ways to expedite the carbon sequestration process is a far-fetched dream given the hindrance caused by the obligation to cater to energy and infrastructural requirements of this gigantic population size; the age-old practice of excess dependence on non-renewable energy sources & the current status quo of India being a developing nation in its rapid growth phase where it cannot avoid a static approach towards developmental activities. Yet, adopting planned scientific measures towards the conservation of carbon sinks might reduce net emissions and contribute towards achieving the concerned NDC. This article provides a fresh outlook toward efficiency and the types of carbon sinks required for a comprehensive approach to achieving the goal. Also, it highlights the current and possible improvisation in legislation and regulation requirements for the optimal use of resources of the state being spent towards accomplishing this goal.*

**Keywords:** Carbon Sinks, Ndc, Paris Agreement, Carbon Sequestration, Emission.

### INTRODUCTION

India's green objectives stand in unison with global climate change alleviating agendas: the momentous Paris Settlement of 2015 & its parent treaty the United Nations Framework Convention on Climate Change (UNFCCC). The central focus of this accord is limiting human-instigated average temperature levels below 1.5°C through adaptation, mitigation & resilience.<sup>1</sup> Growing carbon emission has raised concerns for decades now. In light of this, the Paris Treaty provides hope for a sustainable future on earth given its comprehensive nature than its foregoing counterpart: The Kyoto Agreement. Being a ratifying member, India has calculatedly determined three assessable objectives officially known as Nationally Determined Contributions (NDCs) to be achieved by the end of this decade. The most significant aim among them embraces an agenda to extensively increase carbon sinks to

\*BBA LLB, SECOND YEAR, KIIT SCHOOL OF LAW, BHUBANESWAR.

<sup>1</sup> Jean Brodeur & Zac Cannizzo, United States National Oceanic and Atmospheric Administration, 'NOAA Blue Carbon White Paper', 2022, para 1

counter swelling CO<sub>2</sub> emissions. But, transforming this far-fetched aspiration into reality demands audacious steps by the government to execute proactive measures to preserve the marvels of nature. Growing forest cover alone might not be an adequate course of action. Along with it:emission-controlling measures, conservation of existing carbon sinks, innovative ideas to increase the carbon sequestration process, an effectual system of imposing accountability on beneficiaries giving importance to other equally potential carbon sinks and their safeguarding, etc. will be collectively beneficial.

### **WHAT ARE CARBON SINKS?**

Being a form of matter, carbon is indestructible. It changes itself into different forms through various biochemical processes of nature. However, the form that concerns environmentalists the most is carbon-di-oxide (CO<sub>2</sub>). Because of its greenhouse nature, it retains the emitted heat causing an increase in the earth's average temperature. Since ages, anthropogenic activities have caused a substantial increase in the amount of atmospheric CO<sub>2</sub> which has been a major factor for the existing climate crisis.<sup>2</sup> Colloquially, the name *carbon sink* can be attributed to anything that absorbs more carbon than it already expels into the blue thus contributing to the overall elimination of CO<sub>2</sub> from the atmosphere. Fixation of atmospheric CO<sub>2</sub> by land-dwelling plants and phytoplankton in seas is then later converted into biomasses that exist in the same form for a prolonged period.<sup>3</sup> This is the essence of how carbon sequestration into so-called "*sinks*" contributes to mitigating climate emergency. However, while analysing the capability of these carbon sinks, more regard is given to the balance of carbon flux between the ecosystem and the atmosphere.<sup>4</sup>

### **CLASSES OF CARBON SINKS**

Perhaps, the most efficient carbon sinks on earth are soil, forests, coasts and ocean. But, is every element of these comprehensive constitutes of nature a potential carbon sink? The answer is an obvious no. Longstanding soil probably has a higher fraction of Soil Organic Carbon (SOC) which is a contemporary measure of how organic and nutrient-rich the soil is. As a result, it is a more efficient carbon sink than the one which is found in a desert.<sup>5</sup> Forests act as sinks because plants by photosynthesis capture atmospheric CO<sub>2</sub> and later synthesise

---

<sup>2</sup> T.F. Keenan and C.A. Williams, 'The Terrestrial Carbon Sink', Annual Review of Environment and Resources 2018 (43) 1, 219-243, 219

<sup>3</sup> Bert Bolin, 'The Carbon Cycle', Scientific American, 1970 (223) 3, 24-135

<sup>4</sup> T.F. Keenan and C.A. Williams (n 1)

<sup>5</sup> Sanderman, Hengl, & Fiske, 'Soil carbon debt of 12,000 years of human land use', Proceedings of the National Academy of Sciences of the United States of America, (2017) 114(36), 9575-9580, 9575

organic substances (e.g. carbohydrates) that create the overall structure of the plants (cell walls, woody parts, shoots, roots, etc.). But not all plants perform the process with the same efficacy. This also depends on the surface area, depth of roots, age of trees & ability to photosynthesize in varying CO<sub>2</sub> concentrations. A recent study has found a *Leucaena leucocephala* variety to be having much higher sequestering capacity than any other species.<sup>6</sup> Similarly, in coasts & oceans: marine habitats, aquatic wild organisms, coral reefs, mangrove forests/swamps, seagrasses, tidal marshes, etc. are the key objects for the sequestration of carbon.<sup>7</sup> Termed “blue carbon”, they have proven themselves to be more effectual in withholding carbon for a longer time than their terrestrial counterparts.<sup>8</sup> Even newer ways for emission control like carbon mineralization are in talks. Here atmospheric CO<sub>2</sub> is dissolved and later mineralised into carbonate minerals like calcite and magnesite which store CO<sub>2</sub> for a very prolonged period. But it is tricky to dissolve abundant atmospheric CO<sub>2</sub> and further studies are being conducted in this regard.<sup>9</sup>

## INDIAN APPROACH TOWARD CARBON SINKS

A recent study concludes India is among the top ten countries regarding having the potential of additional carbon storage in its terrestrial forests & soil and can even accommodate around seven billion tonnes of CO<sub>2</sub>. But this does not necessarily suggest a nonchalant approach. The same study shows that most of this potential exists in degraded and used locations that need to be revived.<sup>10</sup> In this regard, the centre is already taking steps such as converting several abandoned mines across the country into green parks which have created a potential 2.2LT/Year of carbon sink.<sup>11</sup> Given that the concerned NDC set by India is primarily targeted towards creating sinks on terrestrial regions only, major strategies of the government are also directed towards refining the same, thus ignoring capabilities of aquatic, coastal and other alternatives. Construction of several greenfield airports has also diverted concentrated pollution in cities to a more unused greener area where the rate of sequestration is more than

---

<sup>6</sup> MSaifuddin, N Osman & M Khandekar, ‘Carbon Sink and Bio-Chemical Potentiality of Two Legume Tree Species’, *Journal of Tropical Forest Science* (2020) 32 3, 217-226, 218

<sup>7</sup> ‘Will India Attain its Forestry NDC Target of Achieving 2.5–3 Billion Tonnes of CO<sub>2</sub> Equivalent Through Additional Forest and Tree Cover by 2030?’ TERI, Policy Brief January 2021

<sup>8</sup> Jean Brodeur (n 1)

<sup>9</sup> National Academies of Sciences, Engineering, and Medicine, ‘*Negative Emissions Technologies and Reliable Sequestration: A Research Agenda*’, (2019)

<sup>10</sup> W. S. Walker and S. R. Gorelik, ‘The global potential for increased storage of carbon on land’, *Proceedings of the National Academy of Sciences of the United States of America*, (2022) 119 (23)

<sup>11</sup> PIB, ‘Coal India Ltd Converts 30 Mined Out Areas into Eco-Tourism Destinations Expands Green Cover to 1610 Hectares’, 21 Feb 2023

in cramped urban locations.<sup>12</sup> Ecological fodder extraction methods are also required for it will limit sequestration to sustainable limits.<sup>13</sup>

To reduce the emission of greenhouse gas the state has adopted programs like blending ethanol with petrol to reduce the consumption of petrol and promote the usage of ethanol (a fuel made from naturally produced materials like crop residues, corn, etc. and which undergoes complete combustion thus leaving very less residue)<sup>14</sup>, mandating vehicular emission norms, subsidizing electric vehicles, replacing wood-based cooking fuels with cleaner LPG fuel under central government schemes<sup>15</sup>, etc.

The notion of paying back to the conservators for availing the services of the ecosystem is gaining importance.<sup>16</sup> Thus the concept of carbon markets has evolved which will provide room for countries to ensure that the *polluter pays principle* is followed in practice and by monetising emission of CO<sub>2</sub> and other GHGs (Greenhouse Gases).<sup>17</sup>

## LEGISLATION & POLICIES FOR INCREASING CARBON SINKS IN INDIA

India is constitutionally empowered to formulate domestic laws in pursuance of transforming promises that it has made during international treaties.<sup>18</sup> Although, it has not articulated any specific law towards particularly addressing the promises it made in 2015, what governs the implementation of those programs is a set of old legislations which continue to govern the system on conservation of the environment and forests.<sup>19</sup> For decades now, there have been problems regarding the fragmented regulation system in the legislation regarding the environment and there exists a vagueness in terms of a single central authority that manages all central and state level affairs. Also, particularly “climate change” phrase isn’t included in either the central, state or concurrent list.<sup>20</sup>

---

<sup>12</sup> Dharam Singh, ‘Role of Greenfield Airports in Greening Indian Economy – Analysis’, (2015) Eurasia Review

<sup>13</sup> Will India Attain (n 7)

<sup>14</sup> PIB, ‘Ethanol Blending Program targets to achieve 20% blending of ethanol in petrol by Ethanol Supply Year (ESY) 2025-26’ 20 March 2023

<sup>15</sup> Will India Attain (n 7)

<sup>16</sup> SuvangiRath and Amarendra Das, ‘Payment for ecosystem services and its applications in India’ (2023) 124, 799-806

<sup>17</sup> PIB, ‘Ministry of Power & Ministry of Environment, Forests & Climate Change to develop Carbon Credit Trading Scheme for Decarbonisation’, 11 May 2023

<sup>18</sup> The Constitution of India 1950, Article 253

<sup>19</sup> Parul Kumar and Abhayraj Naik, ‘India’s Domestic Climate Policy is Fragmented and Lacks Clarity’ Economic and Political Weekly, (2019) 54, 1-13

<sup>20</sup> Ibid

Legislation like the Indian Forestry Act of 1927, the National Forest Policy and the Forest Conservation Act (of 1988 and 1980 respectively)<sup>21</sup>, the Environment Protection Act of 1986, etc. are all very old now and were formulated when the climate crisis was just in a germane phase. Regulatory measures are implemented through Coastal Regulation Zone (CRZ) Notification (2019) under the Environment (Protection) Act, 1986; the Wild Life (Protection) Act, 1972; the Indian Forest Act, 1927; the Biological Diversity Act, 2002; and rules under these acts as amended from time to time, etc. Given the need for immediate redressal, it requires in current circumstances, these legislations need proper amendments to be consistent with global objectives. Although the government has somewhat indicated that these amendments are made already it hasn't yet mentioned what those are true.<sup>22</sup>

Even before India ratified the Paris Agreement, it had already formulated domestic policies for increasing & enhancing the cover of forests & carbon sinks in 2011.<sup>23</sup> In pursuance of the National Green Mission under the realm of NAPCC (National Action Plan on Climate Change) the state has allocated around 220 crores ( a three percent increase over the previous FY 2022-23) in 2023-24 towards increasing forest cover by allocating it to state government.<sup>24</sup> Although there are complaints that these funds are not used by the state governments properly.<sup>25</sup> The large increase in forest cover is largely because of an increase in open forest cover (2621 sq. km) rather than dense cover ( only 501 sq. km) which is also said to be inflated.<sup>26</sup>

Indian Carbon Markets and Carbon Credit Trading Scheme are set to be established as sought by the recent Energy Amendment Act.<sup>27</sup> Considering the potential of blue carbon<sup>28</sup>, there exists no particular provision to include them within NDC nor any law regarding that is present in the nation. Moreover, while considering several litigations the Supreme Court and NGT have several times talked about carbon sinks and their growing importance. Forex: in a long pending litigation about the construction of super-wide highways for hassle-free connectivity of *ChaarDhams* throughout the country, the Supreme Court recapitulated the

---

<sup>21</sup> Will India Attain (n 7)

<sup>22</sup> Parul Kumar (n at 20)

<sup>23</sup> Ministry Of Environment, Forest And Climate Change (MoEFCC), Government of India, 'National Mission for A Green India', (Mission Document 2021)

<sup>24</sup> PRS Legislative Research, '*Demand for Grants 2023-24 Analysis Environment, Forests and Climate Change*' 16 Feb 2023

<sup>25</sup> *ibid*

<sup>26</sup> *ibid*

<sup>27</sup> The Energy Conservation (Amendment) Act, 2022

<sup>28</sup> Blue Carbon: IUCN Issues Brief, November 2017

importance of carbon sinks in the Shiwaliks and Himachal regions and the need for a robust mechanism to conserve them.<sup>29</sup>

### FACTORS INFLUENCING DEGRADATION OF CARBON SINKS

While carbon sinks have been mitigating human impact on precious nature since the very inception of flora and fauna, yet, not only anthropogenic activities but also inevitable natural processes simultaneously dampen this carbon sequestration and storage process. Considering degradation factors, the ones which are factors globally are also factors in the Indian context. Soil as a carbon sink might lose its carbon sequestering ability when those native soils are converted for agricultural or other human activities.<sup>30</sup> Soil erosion is another such phenomenon that might cause its deposit into a depression sight hindering its absorbing capacity.<sup>31</sup> Perennial crop plantation is less practised and very few people favour orchards and vineyards (while they have excellent carbon storage capacity). Whereas, normal field crops contribute to the release of CO<sub>2</sub> because of frequent dislocation of the soil underneath.<sup>32</sup>

Moreover, factors light varying amounts of sunlight, water content (especially in the roots), temperature, and additional nutritional requirements influence the amount of net sequestration even by fruit-bearing plants. This indicates an absence of any straight jacket formula to determine the best plants for the purpose of emission control.<sup>33</sup> Extensive infrastructural abuse of land for construction/mining, the manufacturing process of cement<sup>34</sup> and unsustainable land use can also be factors for the dilapidation of natural sinks.<sup>35</sup>

Journal of Legal Research and Juridical Sciences

### SUGGESTIONS

Densely populated concrete jungles require more and more green cover for decreasing GHG content in the atmosphere. Planting small high-sequestering plants alongside roads, highways, and streets. Also, India has not given any thought to other types of carbon sinks than forest cover and soil. This is primarily because there is comparatively less research on the sequestration capacity of coastal greens, mangroves, blue carbon and carbonate minerals.

---

<sup>29</sup> Citizens for Green Doon and Ors v Union of India (UOI) and Ors[2021] 14 SCR 503

<sup>30</sup> Soil carbon debt of 12,000 years (n 4)

<sup>31</sup> R. Lal, 'Soil Carbon Sequestration Impacts on Global Climate Change and Food Security', *Science*, (2004) 304 5677, 1623- 1627, 1624

<sup>32</sup> S Sharma, VS Rana, H Prasad, J Lakra and U Sharma, 'Appraisal of Carbon Capture, Storage, and Utilization Through Fruit Crops', *Frontiers in Environmental Science*, (2021) 9 700768

<sup>33</sup> *ibid*

<sup>34</sup> *ibid*

<sup>35</sup> S Mathur, H Waswani, D Singh and R Ranjan, 'Alternative Fuels for Agriculture Sustainability: Carbon Footprint and Economic Feasibility', *AgriEngineering* (2022) 4, 993-1015

Regulatory mechanisms for them are essential so that alone forestry isn't pressurised towards achieving NDCs. People in tribal areas (although less in number) are largely dependent on fuelwood consumption and LPG facility isn't available to them, leading to deforestation and added pollution from burning wood.

Although, India and USA have launched a joint initiative *Trees Outside Forest in India* which vows to increase the tree cover in regions outside forests like parks, meadows, pastures, farms, cities, etc. yet this is only launched in seven states and not all states.<sup>36</sup>

Even though there is no dearth of on-table discussions regarding practising sustainable agriculture regularly among policy-makers, yet much fewer efforts have been made to practically educate the real farmers living in rural areas about how to implement those methods, explaining to them the science behind it and how to implement those cost-effectively.<sup>37</sup> Adopting zero/conservation tillage programs might also be considered, as some scientists have found it, to be effective because it lets the soil remain undisturbed.<sup>38</sup>

## CONCLUSION

India has targeted to achieve an overall zero carbon emission by the year 2070. This implies that it should be able to design a fully large & impactful mechanism to catalyse carbon sequestration which means even if the emission of carbon occurs, it should be able to counter it through its abundant carbon sinks.<sup>39</sup> But as of now the NDC it has agreed to is a far-fetched dream given that time and again due to rapid development and abuse of ecological resources India has witnessed major degradation in the quality of carbon sinks. Still, then, combined efforts of the state right from the central to the ground (rural panchayat) level along with the imposition of accountability & costs on exploiters of nature's resources can achieve this NDC.

---

<sup>36</sup> Trees Outside Forest in India Program <https://www.cifor-icraf.org/tofi/>

<sup>37</sup> A Ekka, Md Aftabuddin and A Pandit, 'Effective carbon management for carbon market compliance by the rural sector in India', *Current Science*, (2016) 11111, 1780-1786

<sup>38</sup> H Wang and S Wang, 'No tillage increases soil organic carbon storage and decreases carbon dioxide emission in the crop residue-returned farming system', (2020) 261 110261

<sup>39</sup> India's Updated First Nationally Determined Contribution Under Paris Agreement (2021-2030), August 2022