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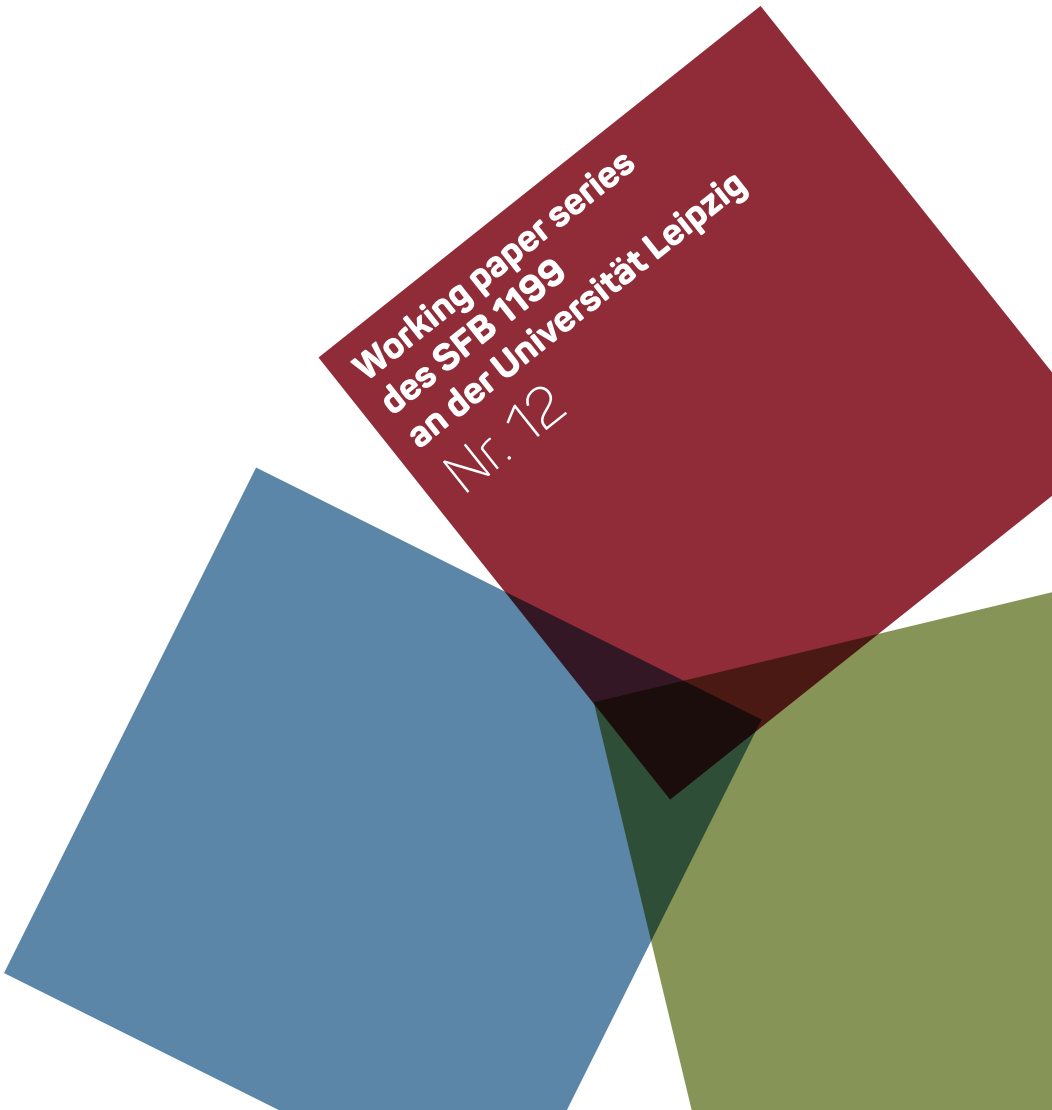
under the Global Condition

Arne Harms

Accretive Enclaves: Carbon Sequestration and Market-based Conservation in India



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Content

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Garam Chand[1] met the assessors at the potholed road connecting the remote tracts high up the mountains to the sprawling and properous valley floor. As elected village watchman in charge of guarding the recently established forest, it was his duty to welcome the team of assessors and guide them up to the forest patch. After exchanging a few pleasantries, they shoulder their equipment and set out on the steep footpath leading up the mountain. It is a brisk walk. At times, the assessors have difficulties catching up. They are not new to these hills, nor is this the first time TUV Nord assigned them to audit forests in the remote areas of the state. But most of the time they work desk jobs, making them somewhat unprepared for this hike.

The track leads them right through the village and adjoining apple orchards, further up across old forests, and finally to what until recently was an open, barren slope. The largest part of the slope is now divided off by a massive, barbed wire fence, enclosing a terrain lined with young trees from end to end all the way up to the mountain top. It clearly marks the outer parameter of the project site, securing the emerging forest and indicating a shift of usage regimes between inside and outside.

The fence forces the team to pause. Halting, the assessors check their maps and GPS devices, which feature fence and enclosed terrain. They have reached their target destination, one of altogether 420 patches of newly planted forests dotting the North Indian state of Himachal Pradesh. To them, this patch is a carbon sink, a clearly demarcated forest terrain subject to particular care and monitoring for the purpose of capturing carbon dioxide in its forests, shrubs, and grasses. It is an area figuring in multinational efforts aiming at offsetting Greenhouse Gases (GHG) by trapping the latter in biomass and thus securely eliminating it from the atmosphere.

After the brief pause and with the help of Garam Chand, they haul their bags across the fence and cross it. They are not the first team of visitors making it up here. Before them, others had come to enlist support for pending afforestation drives among villagers or to supervise plantation works. By contrast, this team is here to assess in precise scientific terms how much biomass has grown on the patch and, thus, how much carbon dioxide this forest has sequestered from the atmosphere. To this end, they spent the better part of the day assessing plants on the slope and generating numerical figures representing plants by applying standardized routines.

Sitting down with me, Garam Chand would later describe the day's proceedings as uneventful. I knew him, my landlord, as short-spoken.[2] He began by telling me of this day as simply a day spent taking the team up and counting trees. That was it, he said. It took me a while to convince him to explain in greater detail how they went about it. But even as the whole encounter was boring to my landlord, it formed an essential part of the carbon forestry regime. The data generated by the assessors for TUV Nord represents means to prove the functioning of the emerging forests as carbon sinks, trapping and containing exactly ascertainable volumes of GHG. Thus, the data generation is involved, I suggest in this paper, in establishing a zone of sequestration and, similarly, in constituting blocks of carbon dioxide successfully offset, or so the story goes, by way of transforming it into biomass and depositing it into the landscape.

But this is not an end in itself. For the data is being circulated in the corridors of development institutions and state ministries that are establishing climate change mitigation efforts. In the end, the data is treated as a key variable in calculating payments that are due to Garam Chand and his fellow villagers as compensation for their efforts to render the fenced terrain as a working sink.

In this working paper, I explore dynamics of space-making tied to contemporary forms of environmental governance. I present a case study from the Indian Himalayas, highlighting, what I understand as, techniques of enacting carbon sinks and of rendering the latter as novel forms of enclaves. I demonstrate that carbon sinks are not simply a given but that they are created by way of orchestrated routines undertaken by very differently situated actors. I analyse the establishment of sinks at two poles of analysis: villagers

1 All names of persons and places are anonymized.
2 This paper builds on two fieldwork trips in Himachal Pradesh—one in February 2016, and the other between February and June 2017.

cordoning off and reworking particular terrain through mundane practices, on the one hand, and data workers, on the other hand, harvesting and working data according to complex routines in order to shuffle them along global circuits of carbon accounting and trading. In this working paper, I begin accounting for three key practices that figure prominently in my research project. These key practices are the demarcation and physical transformation of a given terrain; the computing of site-specific totals of carbon sequestration; and the stitching together of such totals towards the constitution of larger blocks. Taken together, these key practices render, I suggest, subjected terrain as enclaves. Social sciences consider enclaves in three partly overlapping ways. Students of urban life consider the notion of ethnic enclaves in order to theorize transnational entanglements, belonging, and processes of ghettoization.[3] Students of borderlands use enclaves as a prism to analyse the vagaries of legality, citizenship, and belonging along contested national borders.[4] A third body of scholarship analyses forms of economic enclaving.[5] They draw attention to the procedures, and consequences, of rendering demarcated land as zones of virtually unhindered economic activity. Featuring lax labour and environmental regulations, tax exemptions, and low rents, such zones attract global venture capital and have become sites of highly exploitative and polluting activities. The second half of the twentieth century saw the implementation of zones or enclaves across the globe in a wide range of forms, from free trade zones[6] and science industrial parks[7] to special economic zones[8] and extractive mining enclaves.[9] If these are all merely "enclave formats", as Keller Easterling posits,[10] or if we are rather observing a diversification of zones, with enclaves being one among other such respatializations, remains an open question.

In this paper, I complicate the picture by accounting for related yet distinct articulation of enclaves. This paper, therefore, contributes to the conceptual apparatus developed at the SFB by fine-tuning one of the key concepts and by asking whether enclaves in these multiple forms can be analysed as one spatial format *(Raumformat)* while preparing the groundwork for a detailed analysis of its embeddedness with contemporary spatial order *(Raumordnung)*. I do so by drawing attention to contemporary forms of environmental conservation that are driven by global climate change mitigation funds and operate through the establishment of carbon sinks.

I frame such sinks as accretive enclaves. I demonstrate that—as in economic enclaves—dedicated governance procedures aim at segregating sinks from their environs and subjecting them to distinct governance patterns, here using funds and powers of the global carbon trade. It is no coincidence, I suggest, that the same development institution pushing for the establishment of economic enclaves for the last decades—the World Bank—is also behind the kind of accretive enclaving I account for in this paper. Due to the World Bank's efforts, the services provided by the enclaved forests are recalibrated from regional economies towards the global reality of climate change. But in contrast to most other forms of enclaves, the sinks I analyse in this paper operate by storing stuff deemed dangerous, that is, CO_2 and other GHG. They are, in other words, not valued as zones of extraction or production but of slow accretion.

A number of studies analysing carbon trade and carbon forestry have explored the dynamics of quantification and measuring as moments of value generation, detailing the creation and circulation of distinct types of credits—certified emission reductions (CERs).[11] Contributing to this literature, I am more interested in the

3 See e. g. M. Zhou, *Chinatown: The Socioeconomic Potential of an Urban Enclave*, Pennsylvania: Temple University Press, 2010.

4 See *e. g.* J. Cons, *Sensitive Space: Fragmented Territory at the India-Bangladesh Border*, Seattle: University of Washington Press, 2016.

5 See *e. g.* N. A. Phelps, M. Atienza and M. Arias, "Encore for the Enclave: The Changing Nature of the Industry Enclave with Illustrations from the Mining Industry in Chile", *Economic Geography* 91 (2015) 2: pp. 119–146.

6 M. Maruschke, "Zones of Reterritorialization: India's Free Trade Zones in Comparative Perspective, 1947 to the 1980s", *Journal of Global History* 12 (2017): pp. 410–432.

7 D. Massey, P. Quintas and D. Wield, *High-Tech Fantasies: Science Parks in Society, Science and Space*, London: Routledge, 2003.

8 J. Cross, *Dream Zones: Anticipating Capitalism and Development in India*, London: Pluto Press, 2014.

9 M. Côte and B. Korf, "Making Concessions: Extractive Enclaves, Entangled Capitalism and Regulative Pluralism at the Gold Mining Frontier in Burkina Faso", *World Development* 101 (January 2018): pp. 466–476, www.sciencedirect.com/science/article/abs/pii/S0305750X16305253 (accessed 15 October 2018); K. Werthmann and D. Ayeh, "Processes of Enclaving under the Global Condition: The Case of Burkina Faso", Collaborative Research Centre (SFB) 1199 Working Paper 4, 2017.

10 K. Easterling, *Extrastatecraft: The Power of Infrastructure Space*, New York: Verso, 2016, 36.

11 See *e. g.* A. Gupta et al., "Making REDD+ Transparent: The Politics of Measuring, Reporting and Verification Systems", *Transparency in Global Environmental Governance: Critical Perspectives* 181 (2014): pp. 181–201; I. Lippert, "Environment as Datascape: Enacting Emission Realities in Corporate Carbon Accounting", *Geoforum* 66 (2015): pp. 126–135.

functioning of data as a means to establish the emergence of sink space over time, and thus in temporal[12] and multimodal dimensions[13] of doing space. Against this background, I argue that to speak of accretive enclaves refers to the reorganization of a given territory and to the constitution of digitally assembled, virtual spaces that are tied to these territories by way of data and fences, operating as vectors. The study of sinks then becomes an exercise in tracing shifts in making space by differently positioned actors across scales and bound by, what Jessop calls,[14] multispatial meta-governance. It also demands to take into account the webs or archipelagos of such enclaves scattered across much of the forested parts of the Global South, and to theorize their relevance for the governance of the atmosphere in the Anthropocene. In illustrating the case study and presenting preliminary results, this paper is an attempt to begin answering these questions.

Carbon forestry is a global form. This thriving school of forestry is driven by the idea that the worst anthropogenic global warming can be mitigated by capturing carbon dioxide within biomass, in this case, in plant matter and soil. To this end, scientists operating within the fold of carbon forestry have developed registers attributing individual carbon storage capacities to individual tree species, ecosystems, or landscape types.[15] At the same time, powerful multinational institutions, such as the World Bank, have sought to implement carbon forestry procedures. They have pooled substantial funds for experiments with carbon forestry, establishing, for instance, the BioCarbon Fund.[16] In addition to that, the World Bank has lobbied heavily to include carbon forestry segments in existing or upcoming forestry-related development projects across the Global South. But to the World Bank, the turn to carbon forestry also involves a shift in funding procedures on the ground. Individual projects have been designed so as to remunerate resource users for maintaining forests as sinks over time. That is, these are not simply concerned with planting trees in denuded tracts or with sanctioning activities deemed detrimental to the persistence of forest cover, such as felling, grazing, or setting them on fire. The World Bank rather has pushed for project procedures that aim at incentivizing ongoing maintenance or improvement of forests by way of direct payments accruing every few years.[17] These payments are conceptualized as compensation for maintaining or improving forests—or, as I suggest here—for continuously transforming dedicated slopes into enclaves.

Such payment schemes are not necessary ingredients of carbon forestry. In numerous instances, classical afforestation drives are reframed as the establishment of carbon sinks.[18] It rather highlights that to the World Bank carbon forestry appears to be a vehicle to advance several agendas. It serves as a means of aligning poverty alleviation and financial inclusion (direct payments) with climate change mitigation (carbon sequestration) and the establishment of new markets in environmental services (circulation of emission credits). As a subset of market-based conservation, carbon trading is the subject of a rich body of scholarship.[19] In this paper, I contribute to the literature by exploring processes of spatialization rising from the implementation of carbon forestry. I argue that these efforts to mitigate climate change, alleviate poverty, and create new markets involve the enactment of accretive enclaves.

I demonstrate this pattern of enclaving, first, by turning to the practical transformation of the individual slopes into sink segments. I argue that the practices of fencing, maintaining, and caring involve both material transformations and the reorganization of usage regimes geared at bringing forth carbon-dense spaces. I then turn to the auditing of emerging forest patches, showing that this key practice involves the virtual enactment of enclaves as carbon spaces. I demonstrate that data produced through comprehensive audits has two functions. It is a means of virtually assembling carbon spaces out of forest patches scat-

12 T. Ingold, "The Temporality of the Landscape", *World Archeology* 25 (1993) 2: pp. 152–174; T. Schatzki, "Spaces of Practices and of Large Social Phenomena", Espacestemps.net, 2015, www.espacestemps.net/articles/spaces-of-practices-and-of-large-social-phenomena (accessed 15 October 2018).

13 S. Low, *Spatializing Culture: The Ethnography of Space and Place*, London: Routledge, 2016.

14 B. Jessop, "Territory, Politics, Governance and Multispatial Metagovernance", *Territory, Politics, Governance* 4 (2016) (1): pp. 8–32.

15 See, for instance, S. Goswami, K. S. Verma and R. Kaushal, "Biomass and Carbon Sequestration in Different Agroforestry Systems of a Western Himalayan Watershed", *Biological Agriculture & Horticulture* 30 (2014) 2: pp. 88–96.

16 N. McDowell, "Developing Countries to Gain from Carbon-Trading Fund", *Nature* 420 (November 2002): p. 4.

17 P. D. McElwee, *Forests Are Gold: Trees, People, and Environmental Rule in Vietnam*, Seattle: University of Washington Press, 2016.

18 Government of India, "India's Intended Nationally Determined Contribution: Working Towards Climate Justice", 2015, www4.unfccc.int/Submissions/INDC/Published%20Documents/India/1/INDIA%20INDC%20TO%20UNFCCC.pdf (accessed 15 October 2018).

19 See *e.g.* S. Böhm, *Upsetting the Offset: The Political Economy of Carbon Markets*, London: MayFlyBooks, 2009; S. Paladino and S. J. Fiske (eds.), *The Carbon Fix: Forest Carbon, Social Justice, and Environmental Governance*, London: Routledge, 2016.

tered around the state. At the same time, it allows the emergence of such spaces over time to be taken into account. I posit that the reworking of terrain, subject to distinct governance regimes and auditing, coalesce in the creation of enclaves.

Enacting spaces: fences, regimes, and proprietors

In the village, the establishment of carbon sinks began with a string of meetings arranged with the help of aspiring village leaders. In early 2008, forest guards[20] stationed at the nearby provincial town of Kullu had made it up to Bhekhli village, introducing themselves as project staff implementing this latest World Bank project.

The World Bank introduced carbon forestry not only to Bhekhli, but also to India as a whole. In doing so, the World Bank utilized the Clean Development Mechanism (CDM), a financial instrument conceptualized by the United Nations Framework Convention on Climate Change (UNFCCC) and devised to align development assistance and carbon offsetting under the umbrella of so-called green growth.[21] Given the long engagement of the World Bank in Himachal Pradesh, and it being a flagship state to development banks and aid organizations in India, the World Bank was keen on implementing a carbon forestry experiment there. After all, Himachal Pradesh is a state, where, as I was told in posh metropolitan offices during summer 2017, development works, and so the chances were better than almost anywhere in India to realize a pioneering carbon forestry project. The tight control state authorities have on the territory, and the rather successful purging of corruption within the state, seemed promising for afforestation projects to be successful. Or, to put in the language of climate finance, given these favourable circumstances, it seemed likely that forests were to act as carbon sinks now and in the foreseeable future.

As the first meeting commenced, the project staff elaborated in rather general terms on the virtues of forests and the need to increase forest cover in the region. Nothing of this seemed new to villagers. In the hills, forests are considered life sustaining and generally form the economic backbone of village life.[22] Conservation of forests is thus a widely agreed upon fact and afforestation[23] activities generally much welcomed. After their opening statements, the project staff announced that substantial funds had been cleared for the purpose of massive afforestation drives in the valley.[24] They explained that the funds would be used to cultivate new forests on denuded parcels across the state. To this end, members of their project had been on the lookout for suitable sites, agreeing eventually that one of the slopes above Bhekhli fit the bill. It was a denuded terrain, officially under state jurisdiction, and large enough to eventually house a substantial forest patch. Here they would, so they went on explaining, cultivate a new forest with the help of the villagers.

The maps they presented identified the proposed project site, outlining the exact parameter and applying bright colours to the afforestation site. Villagers did not require the map to know exactly which area the bureaucrats were referring to. Villagers knew the area well. Many relied on it as a pasture, or simply were

20 India's state-owned forests are governed through state Forest Departments. Forest guards form the lowest administrative rung comprise these departments. Uniformed and lightly armed, forest guards are charged with patrolling large forest territories and fining misconduct. In Himachal Pradesh, the World Bank is implementing rural projects through Forest Department staff on deputation.

21 S. Ghosh and H. Yasmin, "India's 'Clean Development'", in: S. Böhm and S. Dabhi (eds.), *Upsetting the Offset: The Political Economy of Carbon Markets*, London: MayFlyBooks (2009): pp. 129–137; S. Ghosh, "Mitigating Climate Change: The Indian Way", in: S. Dutta et al. (eds.), *Climate Change and India: Analysis of Political Economy and Impact*, Delhi: Daanish Books (2013): pp. 115–152; M. Gutierrez, "Forest Carbon Sinks Prior to REDD", in: S. Paladino and S. J. Fiske (eds.), *The Carbon Fix: Forest Carbon, Social Justice, and Environmental Governance*, London: Routledge, 2016.

22 A. Agrawal, *Environmentality: Technology of Government and the Making of Subjects*, Durham: Duke University Press, 2005; A. Linkenbach, *Forest Futures: Global Representations and Ground Realities in the Himalayas*, Kolkata: Seagull Books, 2007; S. Vasan, *Living with Diversity: Forestry Institutions in the Western Himalaya*, Shimla: Indian Institute of Advanced Study, 2006.

23 The question if the project I am referring to is implementing afforestation or reforestation is a contentious issue. Project officials largely glossed over the tension by using both designations interchangeably. To most of my interlocutors in the villages, however, it was clearly an afforestation project, that is, a project targeting the cultivation of a forest where hitherto there had been none. In Bhekhli, they insisted that the slope had never been covered by forest, and thus there was nothing to be reforested, only to be afforested.

24 The carbon forestry was actually part of a much larger development project, including several very heterogeneous project components. The number and aim of work packages differed greatly between individual project sites. Aside from one investment in water infrastructure (the construction of a communal rainwater harvesting structure), Bhekhli has to date only benefited from the carbon forestry component.

used to crossing it on their forays into adjoining forests searching for fuel wood and timber. To them, it was a *phag*—a term used to signpost terrains open to all to source fodder or timber and to graze livestock in an unrestricted manner.

The staff found open minds to their proposal. After all, forests provided a number of benefits, and membership in the project might translate into, villagers reckoned, further state-backed benefits. However, the emphasis the Forest Department put on fences and monitoring as well as on quantification came as a surprise. While this was the first afforestation efforts in the close vicinity, all knew of other drives in the valley. None of the other afforestation or reforestation projects my interlocutors were aware of involved the fencing off of targeted terrain. Nor did any other project involve direct payments to villagers according to health and height of individual trees. Yet this is exactly what the project staff were after. Fences, the staff explained, would ensure the survival of trees, and support by the villagers would help secure the forest. Payments, finally, would be a means of compensating villagers for their efforts invested across the years. In other words, they targeted the creation of a forest patch by way of materially setting it apart from its environs by a rigid boundary and subjecting it to a set of distinct governance procedures.

World Bank officials sought to implement a governance regime of this particular plot that was true to the doctrine of market-based conservation. In doing so, they added another layer to the already complex scenario of forest governance in the Himalayas, yet worked towards the implementation of this new regime only on the emerging sinks. Their efforts were driven by a vision of exemption, of singling terrain out as a zone and subjecting it to resource regimes distinct from engulfing ones. In a word, they were pushing for enclaving.

Similar to a large number of carbon forestry projects across the globe,[25] this project is built around the approach of "Payments for Ecosystem Services" (PES). This approach draws on the assumption that ecosystems provide a number of services to humankind, ranging from habitat regulation to provisioning and leisure.[26] Proponents claim that ecosystem services are quantifiable and that it will be wise to put a price tag on them and trade in such services. They argue that there is a global market for ecosystem services emerging, and because high quality services attract the best price on the market, the commodification will ultimately translate into effective environmental conservation.[27] A central element of this framework, and of concrete financial instruments operationalizing it, are individual resource users living within or along targeted ecosystems. As managers, they are rendered beneficiaries of payments accruing for the services "their" ecosystems provide. According to proponents of PES, a tight involvement of resource users on the ground will incentivize proper behaviour, thus making conservation finally work. In Himachal Pradesh, so-called user groups (UG) were the vehicle of this neoliberal move. During the meeting, the visiting staff explained that villagers of Bhekhli would have to set up such a user group. It was to feature as the entity entrusted with maintaining the afforestation plot. To this end, it would become the custodian of the land and the recipient of payments accruing for the services the trees provided.

Garam Chand joined the user group right away. He could use the extra income promised by the project staff. But he remained sceptical about the payments. Given the unreliable nature of the bureaucracy and the strange approach taken by the project, they seemed uncertain to him. Plus, they were promised to come in only in a few years' time. Thus, the offer to act as a daily labourer charged with cultivating the plantation and to do so for an almost immediate pay was attractive to him. So he joined the ranks of villagers hired as construction and plantation workers.

Their first task was to lay out the parameter of the afforestation site and secure it. To this end, they hauled barbed wire up the hill the project had provided. Up there, they cut a small number of trees and made them into poles. Project employees marked the exact contours of the area, comprising of the largest part of the *phag*. Garam Chand and his colleagues where then asked to erect a fence along the outer perimeter per instructions of supervisors. They were digging holes, putting up poles, and connecting them with barbed wires. In doing so, they were translating cartographers' visions of eligible plots into project sites "out there" and similarly realizing the signature feature of enclaves. At the same time, they were literally carving out a zone, enclosing it and setting it apart from its surroundings. When they were done with this task, the largest

25 M. Leach and I. Scoones, *Carbon Conflicts and Forest Landscapes in Africa*, London: Routledge: 2015; Paladino and Fiske, *The Carbon Fix*.

26 Millennium Ecosystem Assessment, *Ecosystems and Human Well-Being: Synthesis*, Washington, DC: Island Press, 2005.

27 S. Wunder, "The Efficiency of Payments for Environmental Services in Tropical Conservation", *Conservation Biology* 21 (2007) 1: pp. 48–58.

part of the barren field was cordoned off and thoroughly enclosed. Through their orchestrated labour, they had contributed to the project of enclaving.

The fence became a boundary demarcating an inside and an outside, an orderly sink from an otherwise ambiguous, non-productive slope. The limits now were etched into the landscape, marking the object of planting activities. Besides fixing the parameters of control, poles and barbed wire also carved the area out of the slope within which the growth of trees became rendered as provision of an ecosystem service, within which cellular growth figured as sequestration of carbon dioxide. Garam Chand and his colleagues had established the limits of a space that was hence to become tied to dedicated financial instruments and was to feature within international climate mitigation efforts. In sum, they had been involved in laying the material foundations of an accretive enclave.

The second task was to turn the enclosed terrain into a working sink by introducing desired forms of plant growth. This was a more-than-human affair. It involved the coordination of soils, trees, and humans. A number of villagers were assigned stabilizing gorges crisscrossing the terrain by laying check dams. Project engineers hoped that such dams would check soil runoff during the countless heavy downpours swamping the valley. With soil erosions minimized, the productivity of the soil would increase and thus the carbon sequestration capacity of the sink enhanced. In other words, these works were aiming at transforming the enclosed barren land into zones optimized for accretion of GHG. Other villagers were assigned hauling up saplings. Villagers and project staff had agreed on planting the plot entirely with the extremely popular local pine tree variety (deodar, *Cedrus deodara*). So, the project sent truckloads of tree specimens from different nurseries distributed in the valley up to Bhekhli. From here, daily wage labourers took over, hauling the plants up to the fenced slope. They were planted in straight lines from fence to fence, all the way up to the top of the mountain.

Following the fencing, improving, and planting, the sink was largely left alone. It is supposed to develop almost on its own, in a state of productive inertia and slow accretion, releasing carbon dioxide from the atmosphere by accumulating biomass over time. Only occasionally did members of the user group take it upon themselves to visit the fenced part of the slope to weed it and to replace dead saplings with live ones. Such activities are part of the bundle of contractual obligations on the side of the user group, whose diligent execution served as the precondition for compensatory payments. More demanding has been securing the parameters of the sink in order to exempt it from detrimental human activities.

In the densely populated valleys of the Indian Himalayas, resource extraction by forest-dependent communities arguably is a serious threat to standing and emerging forests. Forests are severely degraded by ubiquitous grazing animals, by man-made forest fires, and in part by excessive extraction of fuelwood and timber.[28] To manage the pressure on forests, and to exempt certain parts from degrading forms of extraction, environmentalists and development specialists have pushed for monitoring and self-monitoring at the hand of forest-dwelling communities. This approach—tellingly named "social fencing"[29]– also found application in carbon forestry. Here it involves charging the user group with monitoring the parcel and, most importantly, preventing breaches in the parameter securing the emerging forest patch. In Bhekhli, social fencing took two forms: one is generalized monitoring; the other is the delegation of control to an elected watchman.

Until early 2017, the post of village watchman was paid, yet earnings were small. When it came to filling the post, the UG quickly decided upon Garam Chand. Of the villagers involved, Garam Chand had perhaps the most intimate knowledge of the slope and the surrounding forests. He also had had the most to lose from the afforestation project. For many years, he used to drive a flock of goats and sheep up the slope every spring. Under his watchful eyes, the animals had been feasting and fattening on the abundant grasses the meadow had to offer. The vast majority of the animals were not his own. In fact, he had collected them every year once the snow receded from kin and neighbours, drove them up and took care of them during the summer for a fee paid per head. With the afforestation project fencing off the terrain, he would have to take the heard to an adjoining forest. The forest also had plenty of grass for the heard, but it was more distant from the village and did not receive as much as sun as the customary meadow, which was a quite serious drawback for Garam Chand, who enjoys taking in the warmth of the sun after cold mountain nights. Installing

28 R. Guha, *The Unquiet Woods: Ecological Change and Peasant Resistance in the Himalaya*, Berkeley: University of California Press, 2000; Vasan, *Living with Diversity*.

29 P.R. Mishra and M. Sarin, "Social Security through Social Fencing, Sukhomajri and Nada, North India", in: C. Conroy and M. Litvinoff, *The Greening of Aid: Sustainable Livelihoods in Practice*, London: Earthscan, 1988: pp. 22–28.

Garam Chand as watchman thus appears partly as a move of compensation and partly as an attempt at securing the support of people using the slope, most heavily, that is, shepherds.

On the other hand, the UG as a whole is charged with generalized monitoring and regulation. Incentivized by the promise of payments, members are expected to reorient their own usage of the slope and to stop using it as a pasture, at least until trees are tall enough to survive grazing. They are also meant to keep others under surveillance, to watch other people's steps and the routes their animals are taking. Crucial is, I was told, a sense of vigilance demonstrated towards the village as a whole. Social fencing here means ensuring that all other villagers know that the parcel is monitored, that its fences mean business, and that the outer parameters are signalling and actually enforcing a switch between usage regimes. Thus, monitoring activities are thought to deepen the work barbed wire fences do.

In this paper, I am bypassing a discussion of social exclusion engendered through social fencing.[30] I rather want to stress that, taken together, planting, securing, and maintaining are geared at transforming the character of the terrain and bending it towards functioning as a storage facility of carbon dioxide. In addition to engraining the distinction between enclosed plot and environs, they are aiming at providing near ideal conditions for the trees to grow, to render what is inside the fence as a site of unilinear accumulation of carbon, and thus to realize what I label as accretive enclave.[31] Clearly, robust fences demarcate the terrain and allow particular unambiguous governance and production regimes to be enforced. In this, material and social fences merge, forming—ideally—two complementary aspects.

At the same time, the fences serve as anchors related to vectors through which individual patches are assembled into greater wholes, whose combined capacity can be traded and circulated globally. In the next section, I explore these dimensions by detailing field-based audits of forest patches and the assembling of data on emerging carbon sinks. That is, I am turning to the role of numbers and algorithms within carbon forestry and to their space-making effects.

Measuring tape, spreadsheets and algorithms: Assembling spaces

During the first meetings and since after, project employees have claimed time and again that specialists would visit plantations to evaluate trees, counting and measuring specimens in order to assess the villagers' work and to decide on payments. The message stuck in the minds of the villagers in Bhekhli and elsewhere across Himachal Pradesh: The more trees survived and the better their shape, the higher the sum villagers were to receive. But well into the project, the frequency of visits decreased dramatically, triggering doubts among villagers if promises would be kept. In Bhekhli, many continued maintaining the perimeter, preventing destruction of the seedlings. It did not involve very much work, could be integrated fairly well into work routines, and might go a long way in including the village into the fold of beneficiaries of state provision or help them to secure other tangible benefits distributed by the World Bank project.

But then, one day after the monsoons, the regional office located in a nearby provincial town called to announce the arrival of a team of assessors. On the phone, the bureaucrat and the secretary of Bhekhli's UG agreed that Garam Chand, the watchman, would make himself available on that day to guide the assessors up and help them out. As noted at the beginning of this paper, together they hiked up, hauled their equipment over the fence, and set out assessing the patch.

The routine is simple, but strenuous. Quantifying the whole plot's biomass tree by tree and shrub by shrub is considered impractical as it is extremely time consuming, project staff emphasized over tea in their small-town offices. Procedures are thus sped up by restraining the assessment of biomass to sample plots, as required by detailed carbon forestry guidelines developed by the UNFCCC. Sample plots are relied upon to arrive at conclusions about the patch as a whole by means of extrapolation. The patch above Bhekhli

30 The inclusion or exclusion of resource users embodied in carbon forestry is the subject of academic and activist debate (Arsel and Büscher 2012; Fletcher et al. 2016). A number of studies have argued that carbon forestry projects under CDM or the Programme on Reducing Emissions from Deforestation and Forest Degradation (REDD or REDD+) have involved the dispossession of forest-dependent communities in different parts of the world. However, in Himachal Pradesh the situation is more complex and does not lend itself to a straightforward exclusion/inclusion binary. We rather see the strengthening of the rights of some at the expense of others (also see Van Hecken et al. 2018)

31 This, of course, is meant to capture the official take on the sink. Villagers situated the sink in different trajectories of value creation and interactions with the state. I explore these dimensions elsewhere.

features three such sample plots. Sample plots are of a rectangular shape, measuring 25×20 meters each, with GPS coordinates anchoring them in space and rendering them real and transparent to a data-savvy bureaucracy. In order to "ensure that permanent plots do not receive differential treatment from forestry personnel"[32], sample plots have been selected randomly right at the onset of the afforestation works and are neither fenced or otherwise marked as distinct from the enclosing afforestation patch.

On the slope, the team of assessors proceeds by temporarily marking sample plots. They form the basic unit of quantifying biomass, one forest guard who had frequently joined assessors told me. Once this is done, they begin counting individual trees, attributing numbers and identifying the species of each specimen. Sitting nearby, one of the team members notes these values down on paper. He also produces a map of the sample plot, featuring a tight grid within which every tree is entered according to its position and through number and symbol representing species.

As a next step, the size of each tree is measured. Applying measuring tape, the assessors quantify height and trunk width of every tree and enter values onto sheets. After all trees are covered and numerical equivalences entered, they turn to the undergrowth present on the sample plot. Grouping all non-timber plants into two categories, shrubs and grasses, they roughly estimate the number and density of each respective type present in the sample plot. Here the routines are laid out much less clearly. This part relies more on estimates, and thus the assessor's ability to make informed guesses about present volumes of biomass. The results of this exercise are again entered into a sheet. This being done, they finally turn to the next sample plot, repeating the routine.

Following UNFCCC guidelines,[33] the second major routine following the quantification of biomass consists of the calculation of biomass totals and the extrapolation of these numbers to represent carbon totals of individual patches and thus to enact forest patches as solidified carbon sinks. Here algorithms developed by forestry scientists based on available statistics are key. Back in their offices, the consultants subjected the data generated in the field to a number of such algorithms sanctioned and distributed by the UNFCCC. First, they work with what official documents call perennial trees accounted for on the slope—that is, trees they measured individually. For each specimen assessed, they enter numerical values of height and trunk width and, importantly, the tree variety into computer-based scripts programmed to estimate the combined biomass of roots, branches, crown, and foliage according to tree variety and to calculate the amount of CO_2 deposited in the biomass. The next step is producing totals of the biomass and of CO_2 contained in shrubs and grasses. Another script—drawing on statistical data and relating it to soil and climate type of a given patch—transfigures the number they came up with in the field into a total of CO_2 present.

Reciprocating the task of locating and temporarily marking sample plots within the terrain, the data produced on these fragments is then extrapolated so as to arrive at estimates about the total volume of CO_2 enclosed on the patch. For the patch above Bekhli, the documents list a total of 43 tons of CO_2 sequestered and stored over the first reporting period.[34] In calling activities such as these inscriptions, Latour and Woolgar stress that data is not simply collected, nor does it provide an unmediated access to truth.[35] Scientific procedures, they argue, provide inscriptions in the form of numbers, graphs, and words that are *taken* as facts. These inscriptions can have a life of their own, and may be involved in the enactment of reality.[36] Through data inscriptions, each individual carbon forestry plot is enacted as a block of carbon dioxide, accrued and fixed in space, and spread uniformly within clearly defined parameters. The audit thus helps in establishing the enclave, in making it legible to the bureaucracy by adding knowledge about its texture and the services provided within the given parameter.

When the totals of all individual plots are computed and noted, the consultants feed them into yet another table. This time, they are merely assembling CO_2 totals in order to represent, as they say, the volume of CO_2 sequestered in all plots combined. Individual blocks of immobilized CO_2 are added to one another, enacting a

32 Mid-Himalayan Watershed Development Project, "India: Himachal Pradesh Reforestation Project—Improving Livelihoods and Watersheds", Bonn: United Nations Framework Convention on Climate Change, 2011, p. 74.

33 United Nations Climate Change Secretariat, "Measurements for Estimation of Carbon Stocks in Afforestation and Reforestation Project Activities under the Clean Development Mechanism", Bonn: United Nations Climate Change Secretariat, 2015.

34 According to the International Civil Aviation Organization (ICAO), 63 roundtrips between Frankfurt/Main and New York account for the emission of 43t CO2. See International Civil Aviation Organization, "Carbon Emissions Calculator", www.icao.int/environmental-protection/CarbonOffset/Pages/default.aspx (accessed 16 October 2018).

35 B. Latour and S. Woolgar, *Laboratory Life: The Construction of Scientific Facts*, Princeton: Princeton University Press, 2013.

36 B. Latour, *Die Hoffnung der Pandora: Untersuchungen zur Wirklichkeit der Wissenschaft*, Frankfurt am Main: Suhrkamp, 2002; A. Mol, *The Body Multiple: Ontology in Medical Practice*, Durham: Duke University Press, 2002.

larger block distributed across the state. At the end of their consultancy, they will forward spreadsheets and summaries to the Forest Department, inscribing the volume of CO_2 sequestered during the first crediting period of the carbon forestry project at 170,756t CO_2, equivalent on 3,216 hectares of land. Individual blocks of immobilized CO_2 thus come to be gathered into larger units making up digitally assembled virtual spaces.

Comprising a variety of documents, these numbers are shifted back and forth between the state's capital Shimla, Delhi, and Bonn, where the UNFCCC has its headquarters. The numerical iteration of the volume is instrumental in negotiating payments from the World Bank and in routing shares to UGs according to the carbon sequestered within the patches they managed. However, the credits produced by this afforestation project in the Indian Himalayas were never deemed to enter the free market. They rather form part of an experimental setup, designed to showcase the economic potential of carbon trading by offsetting excess emissions promoted by the governments of Spain, Switzerland, and Germany. Accordingly, the value of credits had been fixed beforehand, setting the worth of one ton of CO_2 at 4.5 US dollars. In this first reporting period, the project earned 2.5 million US dollars, which were distributed among the user groups after deducting fees and overheads by the Forest Department. Thus, finally, in early 2017 the group in Bhekhli received 2.1 lakh rupees (roughly 3,000 euros) as their share, transferred to their collective account. Importantly, along with the money came the promise that next time the number would be higher as long as the trees continued to grow undisturbed. This promise was effectively asserting and reinforcing the process of enclaving, I suggest, by way of incentivizing it being upheld. In other words, data and money here are means of stabilizing accretive enclaves in time.

Besides being used in payment negotiations, the numbers are also mobilized in reports and position papers circulating in international policy circles. Here the numbers stand in as evidence of efforts undertaken in India to mitigate climate change and as indicators of how to realize India's rather ambitious national climate change strategy.[37] In inscribing carbon totals, these documents and their travels also partake in enacting the state territory as a space interlaced with carbon sinks, rendering it a terrain of climate change finance and a building block of national climate change policies. While numbers thus are relied upon to inscribe and substantiate enclaves, they also help collapsing individual sinks into larger blocks. In doing so, individual enclaves are rendered homogeneous and their services simply portrayed as interoperable and inviting their crediting for pollutions elsewhere.

But logically prior to all that—and this is the point that interests me here—these numbers were invested with expounding the very emergence of sinks. They were imbued, in other words, with registering and announcing the sink as volume of CO_2 amassing in space. Indicating, in other words, contingent emergence of the sink, these numbers highlights temporal qualities of space. This has two dimensions. One refers to data figuring as means of assembling sink spaces, such as the forest patch above Bhekhli, and of stitching distributed carbon spaces together into larger blocks. The other refers to the allure that comes with this particular kind of data to treat sinks as permanent offsets.

First, to assess carbon densities via biomass accumulation is a technique of registering the ongoing materialization of sinks. I have noted in the previous section that sinks are not mere containers but that they are subjected to ongoing work of stashing stuff, of keeping it in the prescribed space, and of keeping the container intact. Against this background, data is envisioned to provide snapshots of contingent transformations, of taking stock, and of helping to make visible a slow process of accretion of biomass and fixation of GHGs.

Assessors and bureaucrats working with their data are concerned with providing evidence of the very emergence of sinks. To this end, assessors climb up to patches, bend over saplings, draw maps, and calculate totals—totals of sample plots; totals of patches containing sample plots; and project totals encompassing all patches. This practice of harvesting and working data marks the formation of sink space, the moment when it comes tangible and to be reckoned with. Data here helps to mark the watershed moment; it establishes the transformation of slope into sink space, literally birthing the sink. Without the generation of data, we would merely see trees; through data, trees, shrubs, and grass are lumped together and jointly enacted as carbon sinks. Data here figures as a means of constituting the space, of enacting it, and of establishing it through delimiting supposedly exact sizes and textures and its concentration and convolution in time.

37 Government of India, "National Action Plan on Climate Change", 2008, www.moef.nic.in/ccd-napcc (accessed 15 October 2018).

The second temporalizing aspect refers the positioning of forests as carbon dioxide sinks well into the future. Taken together and aligned with one another, actors, numbers, and algorithms render sinks as permanent and as blocks of discard extracted from the atmosphere forever. As other science-based practices,[38] carbon accounting is an exercise in inscription. By applying methods and mobilizing instruments, proponents produce values inscribed on paper or electronic devices. These inscriptions are seen as representing features of the real world out there; they are considered facts. When assessors count trees and measure the size of stock in order to produce and circulate numbers, these are framed as total CO_2 reductions. As an inscribed form, CO_2-stored Himalayan enclaves is rendered commensurable with carbon emissions elsewhere, allowing for trades in emission certificates between polluters and sequestering entities in the first place.[39] But in doing so, data inscriptions render the CO_2 stocks perpetual, as a reality firmly and permanently inscribed in forests. Critics of carbon offsetting have noted that this inscribed permanence is misleading.[40] Forests are threatened in their existence by fire or felling operations, and form—by geological standards—evanescent ecosystems. This contrasts with the logic of standing stocks and total reductions drawing on numerical inscriptions. Spreadsheets, algorithms, and gross totals waiting to be circulated contribute to this vision; they help to enact sinks as fixed, ever accumulating containers. In other words, they not only help to render forest patches as accretive enclave, but seem to anchor them in the future.

Conclusion

In this paper, I have explored processes of spatialization implicated in forestry-based carbon offsetting projects. I have argued that offsetting activities involve the transformation of subjected landscapes by physically reworking it and subjecting it to dedicated forms of governance regimes. I have traced this reorganization of space through the process of fencing—both, material and social—, the implementation of finance-based governance regimes and procedures of auditing. I have shown that all these practices were mobilized in order to intentionally establish particular spaces, which I have identified as accretional enclaves. Through demarcating and cordoning off; through subjecting the terrain to the control of a user group and incentivizing usage patterns by way of promised payments; and, finally, through quantifying the accumulation of carbon in dedicated forest patches, these spaces were set apart from engulfing governance and usages patterns and tied to global efforts to curb climate change by way of finance.

I have argued that in these afforestation drives forests are posited neither as grounds to extract resources and spheres of leisure activities nor as counterpart in intimate relations towards non-human entities. They are rather seen to act as sinks for volatile gaseous substances by trapping and enshrining them in trees as the latter grow. With regards to the establishment of sinks I have traced a paradox. On one hand, forests are seen to pursue the labour of taking in and of accumulating carbon dioxide largely on their own. On the other hand, it requires complex quantification efforts to ascertain the precise amount of CO_2 given forest patches are holding. The productivity of forests as carbon sinks, in other words, is not quantifiable via extracted resources, but needs to be established by assessing the actual expanse of a forest. In establishing the outer limits of sinks and the degree of compression achieved within these expanses in numerical terms, carbon forestry actors assemble virtual sink spaces. This assembling—I have argued—involves cascading operations of counting and mapping, to measuring with tape, working data with digital algorithms and stitching totals of individual patches together into larger units. The application of these techniques allows to assemble virtual sink spaces. These virtual spaces are anchored in terrain, with GPS data acting as vectors pointing to outer parameters, fences and sample plots.

I have shown sinks to be distributed across the length of a state and as being isolated from surrounding terrain. While quantification routines render individual sinks as segments of larger units, governance procedures still maintain an enclave quality of sinks. Thus, dedicated forest patches are set apart from engulfing terrain and brought into relation with other such patches, and much less with immediate environs.

38 Latour and Woolgar, *Laboratory Life*.

39 S. Dalsgaard, "The Commensurability of Carbon: Making Value and Money of Climate Change", *HAU: Journal of Ethnographic Theory* 3 (2013) 1: pp. 80–98; J. Whitington, "Carbon as a Metric of the Human", *PoLAR: Political and Legal Anthropology Review* 39 (2016) 1: pp. 46–63.

40 P. Bidwai, "The Carbon Trade and the Marketisation of Global Warming", in: M. Kelley and D. D Souza (eds.), *The World Bank in India: Undermining Sovereignty, Distorting Development*, New Delhi: Orient Blackswan, 2010.

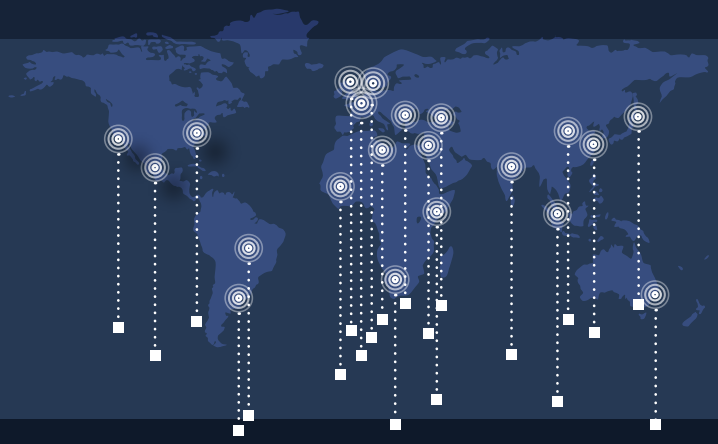
The cumulative vision of larger blocks gets complemented by a vision of distributed units, etched into the landscape and waiting to be added to one another. Closely resembling the hopping of money from one extractive enclaves to the next,[41] World Bank-routed carbon trading funds appear to be similarly jumping from one site to another, producing a new cartography of interconnected spaces of similar appearance, parallel governance regulations and cumulative environmental services orchestrated through financial instruments. In this view, patches are puzzle piece-like segments providing a service that is as localized and material as it is detached from locality and invisible. They form an archipelago working in unison, cumulatively embodying virtual spaces. What I have called accretive enclaves complicates accounts of enclaving as much as it calls attention to complex arrangement of a spatial order *(Raumordnung)*. As other iterations of the enclave, accretive enclaves are anchored by disentangling zones from its environs, aligning nonadjacent territory with one another and producing regimes of interoperability.[42] In accreting enclaves, the hoping of money from one site to another is complemented by a logic of services being provided across sites dispersed across a state or even the globe. To account for the tensions and affordances thereof, and its relevance for spatial thinking, will be a concern of the ongoing research roughly outlined here.

41 J. Ferguson, "Seeing like an Oil Company: Space, Security, and Global Capital in Neoliberal Africa", *American Anthropologist* 107 (2005) 3: pp. 377–382.

42 Easterling, *Extrastatecraft*.

NOTES

CENTRE FOR AREA STUDIES



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