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RESEARCH

Recentering the commons: assessing citizen mapping as an environmental practice

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Abstract

The last three decades have seen waves of coastal development paradigms, the most recent being that of 'blue economy' and 'blue growth' — terms used in conjunction with sustainable development. The blue economy paradigm has its share of discontents across Indian Ocean nations who resist further commodification of coastal spaces and its perverse outcomes in the garb of sustainability. Community-based conservation, citizen mapping of traditional tenure arrangements over coastal commons are emerging counter-strategies in India, to prevent land alienation, and coastal and oceanic 'grab'. The paper does a reflexive assessment of a case of citizen mapping of coastal commons as a legal pluralistic conservation engagement from India. It examines the effectiveness of such localised collaborative civil society exercises against systemic shifts in coastal protection regimes. It details beneficial practices and knowledge generated by such citizen mapping exercises with reflexive insights for civil society actors. It also critically examines the limitations of such civil society efforts constrained by fixed coastal governance frameworks. The paper argues that Indian coastal regulation law's built-in iniquities motivate as well as limit civil society efforts to democratise coastal governance. Local actors' capabilities and social positions themselves further cramp the utility of legal options, making the alienation of the commons all too commonplace under neoliberal environmental governance.

Keywords Citizen mapping · Governance · Commons · Coastal regulation

Introduction

The study of commodification of coastal and oceanic spaces and resources in the Indian Ocean is growing (Campling 2012; Voyer et al. 2018; Fabinyi et al. 2022). Scholars examining commodification have highlighted an attendant trend of increasing enclosure of coastal and marine commons (Seto and Campbell 2019; Ganseforth 2021), rising marine environmental degradation (Fabinyi et al. 2022; Bennet et al. 2021), and failing institutions for coastal resource governance (Segi 2014; Bennett et al. 2021).

Littoral stretches across South Asia were historically governed by diverse community institutions that set in place access and usage norms, based on local ecological knowledge (Pomeroy 1995; Kurien 2007) and socio-political considerations (Ruddle and Satria 2010; Bavinck et al. 2013). Such institutions were not entirely autonomous in their operation and revised their rule-making arrangements in concert with institutions of political rule, whether under local princely states or the administrative machinery of colonial rule (ibid). The privatisation, globalisation, and commodification processes accelerated in the last decades of twentieth century capitalism and industrialisation has led to dispossession and alienation of traditional and customary users from coastal spaces under their custodianship (Hall 2003; Banerjee-Guha 2013; Ayilu 2023). These processes of dispossession have simultaneously led to resistance from fishers and other coastal communities (Ertor 2021; Blythe et al. 2023). In India, marine fishers belonging to diverse castes find themselves socially and politically marginalised within village governance processes more generally (Nair 2006; Rajan and Haribabu 2016), and starkly so in formal

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environmental regulatory law. The absence of substantive legislation that addresses and acknowledges customary rights of marine fishing communities over coastal commons, its use and management, is commonly attributed to this marginalisation (Rodriguez 2010). The Coastal Regulation Zone (CRZ) notification is a specialised legislation for coastal stretches that contain zonation and siting rules, and is a subordinate notification issued under the substantive Environment (Protection) Act, 1986 — a law that covers all of India. The CRZ notification has been diluted from its original environment protection objective over three decades since its promulgation (Sridhar et al. 2008; Menon et al. 2015). The governance of coastal spaces in India is marked by legal pluralism, albeit unequal in its relations as dominant formal governance structures interact more with declining informal governance arrangements (Bavinck et al. 2013).

Against this unfolding context, small-scale fishers within coastal communities have employed various strategies to conserve coastal and marine commons. Since the 1970s, when fishers across India were mobilised as 'fishworkers' under the aegis of the National Fishworkers' Forum (Kocherry 2000; Sinha 2012), their strategies of resistance involved direct action such as public protests and litigation. The turn of the millennium saw the rise in civil society collaborations between non-governmental organisations (NGOs), activists, public intellectuals, and fishers in India (Sundar 2014). Recently, such initiatives have involved a greater use of digital technologies such as GIS-based apps and mapping tools. With these shifts, fishers have increasingly resorted to socio-legal modes of resistance, focusing on addressing procedural aspects of legal implementation. While multiple minor coastal mapping exercises have taken place since the promulgation of the CRZ notification, one initiative inspired the citizen mapping examined in this paper. From 2010 onwards, an alliance between fishers and members of the Coastal Resource Centre, in the coastal city of Chennai in the south Indian state of Tamil Nadu, initiated counter-mapping exercises to record their own use of coastal commons. They used collaborative citizen mapping to contest what they saw as irregularities and corruption in formal coastal planning (Kumar et al. 2014). This instance of counter-mapping was one of the first systematic attempts where members of the fishing community used mapping tools not for 'seeing like the state' (Scott 2020) but to generate new spatial knowledge and challenge land alienation through citizen mapping (Jordan et al. 2011). Following the Chennai mapping example, similar citizen mapping initiatives are underway in various parts of coastal India, holding out the promise of a spatial turn in environmental activism, as in the social sciences (Downey 2006). Does participatory GIS or citizen mapping more specifically hold promise for the environmental justice movement (Jordan et al. 2011) or are there systemic preconditions to the effectiveness of such technologies and practices?

In this paper, we provide a reflexive analysis of the effectiveness of a localised coastal citizen mapping initiative as an environmental practice, within existing regulatory frameworks. The paper begins with a brief overview of the form of legal pluralism that characterises coastal regulation in India and more specifically in coastal villages of Ganjam district abutting the Bay of Bengal. Next, we examine the trajectory of formal coastal regulation in India and structural biases in its design. The paper then examines a citizen-GIS mapping exercise in Ganjam initiated by the authors as a collaboration between their non-government organisation and the traditional fisher governance institution in the village of Purunabandha — the *Kaibarta samaj* (hereafter village committee[1]). The paper critically examines the limitations and possibilities for civil society action in coastal governance within prevalent governance arrangements.

Legal pluralism in coastal regulation in India

The framework of legal pluralism has been applied to coastal areas of South Asia (Bavinck 2005; Bavinck et al. 2013) and refers to the existence of diverse legal systems within the same geographic or social space such that diverse rule-making sources and practices apply to a common set of social actions and activities (Benda-Beckmann and Benda-Beckmann 2010). However, legal pluralistic arrangements have undergone many shifts and presents differently in various sites. In this section, we examine the current state of legal pluralism within coastal regulation in India with greater attention to coastal fishing villages of Ganjam district in Odisha, the site of our citizen mapping case.

Legal pluralism in the governance of coastal commons in India

In India, both state and non-state community-based legal systems operate along the coastal stretches pointing to legal pluralism in the governance of fisheries and coastal land use. In terms of formal governance, coastal zone management in India is overseen by the centre and the state. There are specialised bodies created for this purpose constituted under

[1] Kaibarta is a caste group present in Assam, West Bengal, and Odisha. The term Kaibarta samaj can be loosely translated to this caste group's governance institution. However, the Odia fishers we met used the term village committee to refer to the body. This English term was widely used by fishers of both non Kaibarta fishers of Telugu and Kaibarta fishers of Odia origin. As such, this term has been used throughout the article to indicate traditional fisher caste *governance institution in the fishing village*.

the CRZ notification, namely the National and State Coastal Zone Management Authorities (CZMA) and District Level Committees which allow for fisher participation as three posts are reserved for them. The 73rd and 74th amendment to the Constitution of India created a system of Local Self-Government institutions such as *gram panchayats* (for rural areas) and municipalities (in urban cities), granting them rights to use, develop, and govern community resources including legally notified commons. The custodianship of non-marked public lands rests with the Revenue Department and is often erroneously marked in local terminology to translate as 'wasteland', a revenue category introduced in the colonial period. The land categorisation system is not uniform across the country. Non-private coastal land can officially be recorded as being vested with either panchayats, municipalities, the public works department, the port department, the irrigation department, or the forest department. Such lands and adjacent aquatic-marine spaces are informally governed by diverse traditional community institutions with varying degrees of inclusiveness, such as Kerala's example of *kadakkodi* (Paul 2005). Historically, fishing in India has been a caste-based occupation undertaken by members of single fishing villages/coastal stretches/areas and this single-caste demography led to significant (though not absolute) autonomy in governance compared to agrarian communities of the hinterland (Balasubramanian 2006; Subramanian 2009; Rodriguez 2010). Traditional community governance institutions in the fishing villages were responsible for conflict resolution, implementing local fishing rules and presiding over social and religious functions (Bavinck et al. 2017). However, these traditional institutions are on the decline due to multiple reasons, an oft-cited cause of which is technological change (Paul 2005; Kurien 2007; Nayak and Berkes 2011). The relative economic equality within certain small-scale fisher castes was challenged by the introduction of new fishing gears and crafts leading to lasting impacts on community cohesion (Bavinck 2001). The state-supported mechanisation of the fisheries sector and its export orientation led to the entry of external capital and non-fishing castes into the sector (Kurien 2007), a phenomenon now seen across the country's coastline. Additionally, state interventions have instituted alternate structures of power and governance within the coastal landscape (Lobe and Berkes 2004; Kurien 2007; Rodriguez 2010). However, forms of community resource governance continue to exist in the coastal landscape albeit in evolved forms due to the common property nature of the fisheries and coastal spaces.

Indian legal jurisprudence on commons relies on substantive laws pertaining to specific natural resources. However, emerging case law draws on constitutional and other legal principles to challenge the privatisation of common spaces across rural India. The non-alienability of common lands was affirmed by the Supreme Court of India (hereafter SC) in a landmark ruling in the case of *Jagpal Singh & Ors vs. State of Punjab & Ors. (Civil Appeal No.1132 /2011 @ SLP(C) No.3109/ 2011 decided on 28th January 2011*. The Public Trust doctrine was also invoked by the SC in several cases.[2] Court cases, litigation, and legal judgements have become an important space for rural communities to contest coastal land grab. The growing number of cases at the National Green Tribunal contesting environmental clearances based on the Coastal Regulation Zone indicate the significance of litigation as an option for resisting land alienation and the degradation of coastal commons. The eastern Indian coastal state of Odisha presents itself as a state that attests to the continued operation of legal pluralism by way of community governance of coastal commons, albeit with a diminished role for traditional fisher institutions in land use governance. The coastal state has been witness to a range of actions akin to 'environmentalism of the poor' (Guha and Alier 2013), seen in its stiff opposition to intensive prawn aquaculture in the Chilika[3] lake (Nayak and Berkes 2011) and several other localised struggles against prawn seed collection, and coastal displacement in the 1990s and early 2000s.

Community governance institutions in Ganjam

Where courts and legal actors act as an extension of formal governance arrangements, village committees — traditional governing bodies in fishing villages, have managed to stay relevant by serving as an interface between fishing villages and state institutions. This is seen in the coastal fishing villages of Ganjam district in the state of Odisha, abutting the Bay of Bengal. The interface role is played by the village committee, at times at the behest of government officials, and at other times to meet direct demands from members of the village. For example, the local Range Office of the Odisha Forest Department has recently begun coordinating with village committees to conduct awareness programmes on the conservation of the protected olive ridley sea turtles[4] which nest both sporadically and as an arribada (mass-nesting) along this stretch of the

[2] For example, see Fomento Resorts and Hotels Ltd. and Another versus Minguel Martins and Others, Civil Appeal No.4154 of 2000 with Civil Appeal Nos. 4155 and 4156 of 2000 decided on 20th January 2009 where the Supreme Court of India upheld the traditional access to the beach and directed demolition of a private construction that obstructed it. In M.C Mehta vs Kamal Nath and Others decided on 13th December 1996. In this case, the Supreme Court of India observed that the Himachal Pradesh state government breached public trust doctrine by leasing out an ecologically fragile land to a private company for commercial gains.

[3] Chilika lake is a Ramsar site with around 150 traditional caste-based fishing villages in its vicinity.

[4] *Lepidochelys olivacea* is categorised as vulnerable by the International Union for Conservation of Nature (IUCN). For more details, see Chandarana et al. 2017 listed in the reference.

Odisha coastline. Three of the seven villages we visited including Purunabandha, the site of mapping, also had a dedicated registered fishing society to address concerns related to fishing and to engage with officials of the fisheries department, as an instance of meeting fishers' demands. Nua Golabandha, a formerly displaced and re-settled marine fishing village[5] located along the southern coastline of Ganjam district, was marked for relocation once again, due to the expansion of the Army Air Defence College within the Gopalpur military station.[6] Here, the village committee became the sole body representing the interests of the community, as ward[7] level elections had not been carried out and the formal gram panchayat could not represent the fishers. Village committees in fishing villages of Ganjam have also strategically incorporated the elected ward representative of the gram panchayats as their member, to augment their capabilities as interfacing institutions. Ganjam has a tiered community governance model where individual villages' committees federate at a zonal level and district level to form umbrella bodies that represent the interest of multiple fishing villages which use different crafts and gears (Venugopal et al. 2021, p.19). The zonal umbrella body resolves conflicts between the member villages over fishing grounds and the use of certain crafts and gear. Neighbouring fishing villages negotiate and cooperate through this body over questions of usage of coastal commons and sharing of beach spaces for storing boats and nets, and drying fish. The district umbrella body on the other hand represents the interests of the fishers of the district and is affiliated with Odisha Traditional Fish Workers Union (OTFWU).

Several shifts have accompanied traditional fisher institutions as a result of multiple factors. Small-scale fishers from Ganjam's fishing villages are increasingly migrating outside the district and state due to a combination of push factors such as rising cost of living and increased precarity of life and livelihood, as well as due to pull factors such as the aspiration for a higher income and better life. As 'migrant fishers', both the fisheries and labour departments deny sole jurisdictional responsibility for their welfare (Iyengar and Sridhar 2022). Migration, whether seasonal or cyclical, places tremendous stress on the functioning of traditional institutions, which have even disintegrated in some larger fishing villages like Podampetta and Ramyapatna. In the village of Podampetta, even the village committee president, secretary, and ward member had to seasonally migrate outside the state searching for jobs (Venugopal et al. 2021, p.19). This temporary absence and precarity of livelihoods of even key local self-governance office-bearers results in the disruption of local governance processes, in turn, heightening the possibility for land appropriation, alienation, and degradation in coastal areas with high rates of migration. Community governance in Ganjam is also adversely impacted by the physical degradation of the coastal commons. Odisha's coast is vulnerable to cyclones, coastal erosion, and climate change-induced sea level rise (Kankara et al. 2018). This has led to instances of resettlement of fishers in areas that are far from the seashore without a direct view of the sea, a locational feature that is crucial for fishers to plan fishing ventures or to monitor infractions at sea by other fishers. Resettled communities not only invariably lose access to their old commons, but must also negotiate with existing users of beach spaces in resettled areas. Resettlement changes the governance dynamics as new settlements need to elect new village committee members and oftentimes resettlement sites already house pre-existing settlements with their own leadership patterns and established social relations.

Despite the above-mentioned challenges, traditional governance systems have persisted in Ganjam district by evolving and modifying their functioning to meet emerging demands. Their mediating role is not only limited to state and community relations but also includes engagements with private bodies and non-governmental organisations as well as more political institutions such as fishworker unions. While this mediating role is acknowledged to a limited extent by the lower-cadre officials of government departments and other non-state actors, the marine fishing village committees are ignored in broader scales and sites of legal rule-making and enforcement such as formal CRZ implementation. In the next section, we will briefly examine the CRZ legislation's historical trajectory to understand the space it makes for legal pluralistic practice with coastal conservation and civil society environmental activism.

Interplay of competing interests — trajectory of coastal protection law

Coastal protection legislation in India was promulgated to embody an environmental conservation spirit (Chainani 2007). Over the course of the next three decades, the spirit

[5] The Indian Army initially acquired this coastal stretch of land from the Odisha state government for setting up an Army Air Defence College within the Gopalpur cantonment in 1984.The initial resettlement site was far from the sea and after sustained efforts on the part of the fishers a sea-facing site was provided.

[6] Nua Golabandha is Telugu speaking fishing hamlet that comprised around 900 households at the time of the study. The presence of the Army Air D College nearby has impacted the fisher livelihoods as they are stopped frequently from going to sea during weapons-training sessions and few households had relocated to the nearby localities as a result. The villagers who stayed back in Nua Golabandha are persisting with their demand for higher compensation before agreeing to be relocated once again.

[7] A 'ward' is the smallest electoral constituency for local self-government in India. A gram panchayat is divided into multiple wards based often on the registered resident population.

of this law shifted towards accommodating growing developmental needs resulting in 25 amendments to the original notification and two complete overhauls of the law itself. In this section, we examine the impacts of critical shifts in coastal law on the effectiveness of citizen mapping initiatives towards environmental justice.

Prompted by a short note penned by in 1981 by Indira Gandhi, the former Prime Minister of India and a recognised conservationist (Rangarajan 2009), the newly set up Department of Environment and Forests (later Ministry of Environment and Forests — MoEF) issued environmental guidelines for beaches in 1983 (Chainani 2007). However, illegal construction in the coastal zones continued despite these guidelines, prompting environmental organisations to engage in public interest litigation.[8] The National Fishworkers Forum (NFF) — an umbrella forum representing the interests of small scale fishworkers and their unions across India, undertook a public march in 1989 along the length of India's coast, highlighting multiple concerns including that of coastal pollution (Nandakumar & Muralikrishna 1998). In 1991, the MoEF, then headed by the minister, Maneka Gandhi, a staunch supporter of animal rights and specific environmental causes, promulgated the CRZ notification, 1991 after years of prolonged lobbying by environmentalists of the Bombay Environmental Action Group (Chainani 2007).

The CRZ notification, 1991, prioritised coastal protection by designating the landward side of the coastal area up to 500 m from the high tide line (HTL) and coastal stretches of seas, bays, rivers, estuaries, and backwaters influenced by tidal action as a zone of regulation — the 'Coastal Regulation Zone' (CRZ). It proposed restrictions of activities based on the principle that only those activities that required the waterfront and foreshore area could be permitted in the area governed by the notification. However, the original notification itself made allowances for defence, energy, and shipping requirements. Importantly, it permitted construction of buildings for coastal communities under the ambit of traditional rights and customary uses. The original notification attempted to balance conservation of ecologically sensitive flora and fauna and coastal spaces with that of essential development needs of the country. This in-built design feature of exemptions to classes of activities and conditional permissions was a balancing act between highly unequal user groups. This feature would, in subsequent years, lead to a succession of controversial amendments that accommodated powerful industrial and commercial interests, over protective conservation and small scale fisher (SSF) fisher community interests.

While the CRZ notification was promulgated in 1991, its implementation was not given due attention until the Supreme Court of India delivered a judgement that directed the MoEF to constitute CZMAs at national and state levels.[9] A study, commissioned by the NFF in the aftermath of this judgement, mapped 732 violations related to tourism, infrastructure, aquaculture, reclamation, industry, and mining spread over eight coastal states (Nandakumar and Muralikrishna 1998). This was a low-tech citizen mapping initiative where volunteers from different fish worker unions were trained on the content of the CRZ legislation and identification and mapping of its violations using only visual cues and textual guides. This effort can be considered as one of the first instances of civil society-led mapping within coastal spaces in India.

Despite constituting CZMAs in 1998, CZMPs were not prepared or approved in a timely manner (Sridhar et al. 2006). Taking note of the abysmal state of implementation of the notification, in 2004, the MoEF constituted an expert committee headed by noted agricultural scientist M.S. Swaminathan, to review the CRZ legislation and its implementation. The Swaminathan Committee Report, submitted one month after the Indian Ocean tsunami of 2004, recommended the incorporation of vulnerability mapping and setback lines into the CRZ regime. This report also advocated for a change from regulation to coastal zone management (CZM). However, it failed to address past violations of the CRZ notification or recommend a concrete and democratic implementation mechanism for a shift to CZM (ibid). In 2007, a copy of the draft CZM notification based on the committee report was leaked to the public. NFF and its allies opposed the draft on the grounds that proposed zonation would lead to a proliferation of business activities along the coastal stretches (National Campaign for Protection of Coasts 2007). Responding to the protests, the MoEF consulted civil society organisations and promulgated a new notification — the CRZ 2011, basing its design and provisions largely on the CRZ 1991 with some additions for the calculation of the hazard/setback line. While CRZ 2011 acknowledged the coastal commons, it also permitted many activities that were earlier prohibited under CRZ 1991 leading the NFF to term it as a 'compromise' law (National Fishworkers Forum 2018, p.38).

Like CRZ 1991, the CRZ 2011 also saw repeated amendments over the years that diluted its effectiveness.[10] Many of the amendments systematically diluted the regulation

[8] See the PILs filed by Goa Foundation://goa foundation.org/pil/ .This repository contains several public interest litigations categorised into PILs against resort hotels coming up in coastal area (pre-CRZ notification), PILs against resort hotels violating CRZ 1991, and cases of general CRZ violations.

[9] See Indian Council for Enviro-Legal Action vs Union of India and Others, Writ Petition (C) No. 664 of 1993 decided on 18 April 1996.

[10] Based on data available on the PARIVESH website of MoEFCC, CRZ 1991 was amended 23 times before the promulgation of CRZ 2011, and CRZ 2011 was amended 16 times before promulgation of CRZ 2019.

allowing for land reclamation, destruction of mangroves, construction of transport facilities and post facto clearance, and regularisation for specific activities. Nevertheless, fishers and environmental organisations engaged the CRZ in litigation towards greater coastal protection.[11] In one of the successful instances of litigation by civil society actors, the National Green Tribunal (NGT) delivered a judgement in the favour of Koli fishers of Mumbai and awarded them compensation for loss of livelihood due to project activities undertaken by Jawaharlal Nehru Port Trust and Oil and Natural Gas Corporation.[12] The arguments in this case were based on the right to livelihood, violations of CRZ, and customary rights over oceanic resources (Sahu 2022). Litigation however has depended on accurate documentation and ability to argue convincingly on customary rights, which is where counter-mapping as a strategy is most useful.

Participatory GIS-based[13] mapping of coastal commons and their uses is a more recent strategy employed by fishers in addition to litigation. Commons mapping undertaken in Urur/Olcott Kuppam fishing village in Chennai in response to a proposed coastal expressway was one of the first systematic citizen mapping exercises undertaken using GIS, with direct participation of fishers. Challenging the depiction of coastal commons in the project documents as 'wastelands', fishers mapped their livelihood, infrastructure, sociocultural activities, and demographics and highlighted the uses of these spaces (Kumar et al. 2014).While two non-governmental organisations, Transparent Chennai and Save Chennai Beaches Campaign provided technical support, the ownership of the map and knowledge of how to produce them was vested with fishers from the villages (ibid).

In 2018, Ministry of Environment, Forest and Climate Change (MoEFCC)[14] published the draft CRZ notification 2018 which reduced the role of the hazard lines; removed restrictions on setting up 'strategic', 'defence', 'public utility', and 'eco-tourism' projects in ecologically sensitive areas; and further opened coastal stretches in rural areas for development (MoEFCC 2018). Despite objections from fisher unions and environmental organisations, the MoEFCC retained these provisions and notified the CRZ 2019. The CRZ 2019 had two new provisions added to it, after the public consultations were over (Kapur 2020). One of the clauses added without the option for public scrutiny, allowed the 'development of airports in wastelands/non-arable lands' in CRZ-3 areas[15] (ibid) betraying the persistent belief that coastal commons are unproductive wastelands.

On the one hand, while the CRZ legislation was weakened continuously in favour of industries, on the other, its implementation appeared to be wilfully neglected (Menon et al. 2015). CZMAs continue to be adhoc part-time bodies and district level coastal committees are not operational in many states (ibid). These observations were echoed in the recent performance audit report on the conservation of coastal ecosystems by the Comptroller and Audit General (CAG) of India (2022). The 2022 CAG report observed that the NCZMA meetings did not deliberate on environmental issues but were driven by vested interests of parties demanding a reclassification of zones. It also noted that NCZMA did not discuss any issues related to CRZ violations since April 2015. These observations attest to civil society and fisher community allegations that conservation and coastal protection no longer is a priority in CRZ implementation. The institutional inadequacies that fuel this, especially the lack of resources, and neglect of local scale institutions hinders civil society efforts to work with such a legislation as we will see in the empirical instance of citizen mapping in Ganjam district.

The ineffectiveness of the CRZ regime can be attributed to the design flaw mentioned earlier. In attempting to balance multiple unequal interests, the CRZ is rendered weak and ambiguous as a socially just environmental legislation. This design flaw becomes all the more visible if we contrast it with the Scheduled Tribes And Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 (hereafter FRA 2006), which has allowed for several communities and civil society groups to move forward towards obtaining community rights (Gopalakrishnan 2017). Legislated with the objective of undoing historical injustice committed on forest dwelling communities, this substantive legislation has been hailed for its transformative potential in securing conservation outcomes through democratic forest governance (Kumar et al. 2017). The CRZ, on the other hand, appears to balance competing interests but weighs heavily on the side of more powerful parties favouring the commodification of the coast and oceanic resources.

Additionally, CRZ 2019 similar to its earlier versions fails to consider the gender dimensions of fisher livelihoods. A clear test

[11] For example, see Union Territory of Lakshadweep and Others vs Seashells Beach Resort and Others. Civil Appeal Nos of 2012 (Arising out of SLP (Civil) No.5967-5968 of 2012) decided on 11 May 2012 and Krishnadevi Malchand Kamathia and Others vs Bombay Environmental Action Group and Others. Interlocutory Application No. 23 of 2010 in Civil Appeal No 4421 of 2010 with Contempt Petitions (C) Nos.169 and 266 of 2010 in Civil Appeal No 4421 of 2010 decided on 31 January 2011.

[12] Ramdas Janardan Koli versus the Ministry of Environment and Forests (MoEF) judgement of National Green Tribunal Application No. 19/2013 decided on 27 February 2015.

[13] Geographic Information System.

[14] The Ministry of Environment and Forests (MoEF) underwent a nomenclature change in 2014 and was renamed as the 'Ministry of Environment, Forest and Climate Change' (MoEFCC).

[15] CRZ-3 refers to relatively undisturbed coastal areas (e.g. in rural areas) and those areas not under CRZ-2. It is further subdivided into CRZ 3A, 3B and No Development Zone (NDZ).

of this lies in terminology. For example, while the CRZ notification 2019 makes four references to 'fishermen', it does not make a single reference to fisherwomen or gender neutral terms such as fishworkers. This bias persists despite the contributions of fisherwomen through pre-harvest operations such as net making and post-harvest operations such as cleaning, drying, processing, and selling fish (Ashaletha et al. 2002).

Despite the overall dismal trajectory of the CRZ with respect to conservation, the latest CRZ 2019 notification, although currently being challenged in court (Dias and Sridhar 2021), retains the provisions present in the previous CRZ 2011 pertaining to the interests of fishers in the preparation of CZMPs.[16] These provisions for demarcation of landuse by fishing communities and their community infrastructure on CZMP has provided an opening to demand fisher community participation in the preparation of the CZMPs (Kumar et al. 2014). This was made possible as the local knowledge on land uses and community infrastructure resides with the local communities (ibid). The citizen GIS mapping initiative in Ganjam attempted to explore these possibilities further.

Civil society efforts towards citizen mapping in Ganjam district

Inspired by the systematic counter-mapping undertaken in other parts of India, the authors undertook a collaborative mapping exercise focusing on recording usage of coastal commons. This section describes the process of citizen mapping including team composition, location, and the methods employed. The authors were all associated with a non-government organisation with several years of experience and presence in coastal research and conservation since its inception in 2008 — Dakshin Foundation (hereafter Dakshin). Dakshin is based in Bangalore, Karnataka, but has field offices with staff with either natural or social science training and qualification. The first and last authors were graduates trained in social work — a discipline with an ideological commitment to serving marginalised communities. The first author had experience working with tribal communities in Kerala on issues of dispossession and alienation since 2016. The second author graduated in natural resource governance and had exposure to local institutional arrangements for resource governance. The last author has engaged with coastal rights, CRZ-related campaigns, and served as part of fishworker support networks since 2000. The discourse of fisher participation, democratic decision-making, citizen mapping, and cognitive justice marks these engagements. Fisher participation with CRZ implementation and revising CZMPs to accurately reflect marginalised SSF interests have been discussed at various government and non-government forums that the authors have been a part of, and bear a longer history since the mid-1990s as seen in the previous section. Ganjam district was chosen as our pilot site as Dakshin had a field presence in this site through various programmatic interventions since its inception. Dakshin staff also had personal relationships with various community members and civil society organisations in Odisha, including SSF associations, fishworker unions and local support NGOs, that precede Dakshin's work in the region. The prior relations and familiarity of collaborative work between the NGO team, village committee members and fishers of the selected villages, were important to initiating a pilot mapping exercise and persisting with it even when challenges emerged.

The paper draws from the fieldwork we undertook as part of the citizen mapping which we initiated between June 2019 and March 2020. Dakshin's field team consisted of a social science researcher from Kerala (first author) and a social ecologist from Odisha (second author), advised by the third author, a social scientist and the team lead for the project. The Dakshin team was also advised by other senior researchers and procured GIS assistance from other conservation researchers. Dakshin project staff spent one month in 2019 conducting participant observation, semi-structured interviews, group interviews, and transect walks to acquire a preliminary understanding of the tenure systems, regulations, and various institutions governing the commons in seven fishing villages in Ganjam district. We chose the fishing villages of Purunabandha, Gokharkuda, Podampetta, Sana Nolia Nuagaon, Sana Aryapalli, Nua Golabandha, and Prayagi for this pilot study. These villages were chosen because, taken together, they represented different complexities associated with the management of coastal commons. For example, the Defence College near Nua Golabandha had placed restrictions on fishing during its weapons training sessions. Similarly, Gokharkuda's beaches are home to one of the few global olive ridley sea turtle mass-nesting sites and hosts a hatchery managed by the Forest Department leading to seasonal restrictions on the uses of beach spaces during the mass-nesting and hatching periods. During the pilot study, we conducted semi-structured interviews with village committee leaders, ward members, fishing committee leaders, activists, scholars, and government officials from various departments such as fisheries, forests, revenue, and local self-government institutions. We also undertook group interviews with community members. The pilot study revealed various challenges to the commons in the form of encroachment for agriculture and aquaculture and degradation via coastal erosion and pollution

[16] See Annexure IV, guideline 5, clause (iii) states the following: "In the CRZ areas, the fishing villages, common properties of the fishermen communities, fishing jetties, ice plants, fish drying platforms or areas infrastructure facilities of fishing and local communities such as dispensaries, roads, schools, and the like, shall be indicated on the cadastral scale maps. States and Union territories shall prepare detailed plans for long term housing needs of coastal fisher communities in view of expansion and other needs, provisions of basic services including sanitation, safety, and disaster preparedness" and section 3.5 about management of critically vulnerable coastal areas.

and alienation through the weakening of the community structure. We conducted a total of seventeen semi-structured interviews and thirteen group interviews during this time period, aside from numerous informal conversations with Dakshin's team members who are associated with this site over two decades.

The team then chose the estuarine fishing village of Purunabandha to pilot the citizen mapping initiative. Purunabandha, a small fishing village[17] situated near the mouth of the river Rushikulya was chosen due to the good rapport the organisation had with its fisher leaders. Additionally, three individuals from the community who were also long-term field staff with Dakshin's long-term 'Marine Flagships Programme', which had undertaken sea turtle monitoring at this site since 2008[18] had just been elected to the village committee providing a strong entry point to Dakshin to initiate wider conversations in the village around mapping with the committee's support.

The village committee leaders approved of the mapping initiative as they felt that mapping the areas they have been historically using would be advantageous to stop the ongoing problem of encroachment of commons by non-fishers from adjacent hinterland villages. Once the incumbent village committee approved the initiative, we met with the ward member and fishing committee members and past village committee members, to seek their support for a meeting to present the mapping proposal to the larger community. The prompts for the transect walk and mapping were prepared after four key informant interviews and two focus group discussions with fishermen and fisherwomen, separately. We also drew from the insights obtained through the pilot study to develop the prompts. Once the prompts were ready, we met again with the community leaders to plan the mapping. The three village committee members associated with Dakshin were proficient in using Global Positioning System (GPS) devices and they undertook the bulk of the mapping. The community members pointed out and mapped the areas that they considered commons, while the technical team documented the past, present, and seasonal uses of these spaces as well as the norms governing them through interviews and focus group discussions. We conducted seven transect walks with the community members. However, the transect walks we had planned with fisherwomen, children and neighbouring non-fishing coastal communities had to be dropped due to the COVID-related restrictions and some of these interactions occurred via Google Meet video conferences. The fieldwork was completed in March 2020.

The community generated knowledge consisted of information about built space as commons and open common spaces, and the changes in access, use and control of both categories' spaces over time. Broadly, the built space commons consisted of a fish drying house and cold storage rooms built as a part of the Integrated Coastal Zone Management Programme (ICZMP), a primary school, multi-purpose cyclone shelter, the jetty house, the Maa Gangadevi temple, and a fish drying hall funded by United Nations Development Programme. The mapping process also revealed that some of these built commons constructed through external funding were not suited to meet the communities' needs indicating weak consultation and consensus in these decision-making processes (Venugopal et al. 2021, p.21-22). The open common spaces were used for storing and repairing nets and boats, landing and drying seasonal catch (shrimp, crab and small pelagics), auctioning, trading and selling fish, recreation, burial grounds, sport, and for conducting community meetings and gatherings (Venugopal et al. 2021, p.23-24). The community generated information covered details on access and use and abuse of commons by non-fishing communities and their impacts on local practices and conflicts.

The community-sourced uses of the coastal commons were superimposed with the CZMP and the revenue map of the village using GIS. We kept the same terms used by the community members in the maps. We downloaded the CZMP maps of Ganjam district from the website of the Odisha CZMA — one of the few coastal states to have uploaded its maps on a publicly accessible website. The revenue information was obtained by purchasing cadastral maps of the revenue survey from the Map and Survey Publications office. These maps were based on the revenue survey in 1976 and did not reflect the subsequent changes in ownership and category. While the Odisha government was in the process of digitisation of land ownership data, the web portal hosting these records was yet to reflect the latest data at the time that we checked it.[19] Eventually, the team was able to access updated revenue information from a physical copy kept in the local revenue office.

The creation of the map using GIS was done off-site due to the outbreak of the COVID-19 pandemic. During a community meeting in March 2021, the physical copies of both English and Odia versions of the map were presented to the community members along with a booklet describing

[17] Fishers in Odisha mostly belong to Odia caste groups who traditionally practise riverine/estuarine fishers, and marine fishing castes who belong to Telugu or Bangla speaking groups.

[18] The individuals mentioned were associated with sea turtle monitoring prior to Dakshin's inception, when such activities were undertaken under the aegis of other organisations, namely Indian Institute of Science and Ashoka Trust for Research in Ecology and the Environment (ATREE) (Shanker 2020).

[19] As of June 2023, the Odisha government's web portal on land records states that it contains updated information and records. See http://www.bhulekh.ori.nic.in/Help.aspx

how the maps were made. This meeting also served as a verification process where community members pointed out common areas that were missed on the map. In the next section, we highlight the insights from our field exercise against specific factors.

Citizen mapping — reflexive insights

A reflexive examination of the citizen mapping process revealed both constraints imposed by the CRZ framework as well as its possibilities. It spotlighted the constraints attributable to technology and social location of the participants, and identified preconditions for citizen mapping to translate into environmental justice and democratic coastal governance. '(In)accessibility of spatial knowledge in state and citizen mapping' contrasts the accessibility of spatial knowledge generated via citizen mapping and official mapping. 'Limits to inclusion in citizen mapping processes', 'Limited utility of citizen mapping within the CRZ legislation', and 'Sustainability of citizen mapping efforts' engage with limits to inclusion in the mapping process, utility, and sustainability of citizen mapping within the CRZ framework.

(In)accessibility of spatial knowledge in state and citizen mapping

The on-ground citizen mapping process highlighted gaps in both the process and the knowledge generated in official coastal zone records. It also demonstrated the inaccessibility of official spatial knowledge. In this section, we elaborate on the gaps in the existing process for preparation of the CZMPs and how the participatory mapping initiative came upon these and tried to address them.

The CZMPs accessed from the website of the Odisha SCZMA were prepared based on the CRZ 2011. In addition to the CRZ boundaries and revenue boundaries, these CZMPs indicated fish landing centres, fishing harbours, jetties, and fisher villages (residential areas). However, they did not indicate other uses of the coastal commons such as spaces for storing and mending nets, anchoring boats, recreation needs, holding community meetings, or gleaning and fishing in the intertidal mudflats of certain fishing villages. Thus, the CZMPs ignored the full spectrum of livelihood related uses as well as the social and cultural uses of common spaces. The official maps did not indicate seasonal and overlapping uses either. The citizen mapping exercise highlighted the peculiarities of fishers' relations with coastal spaces which shifts with changes in the river mouth and the local landscape. 'The places where we used to keep boats a few years back no longer exist and are now submerged in the river. Five years from now this place where we keep our boats now will not be there,' (Elderly fisherman, Purunabandha as cited in Venugopal et al. 2021, p10). Uses of the coastal spaces of Purunabandha also vary seasonally. For example, one of the places used to store nets and smaller boats was earlier used as a public bathing space during the monsoons due to the formation of rainfed ponds.

Unlike CZMPs in Tamil Nadu, CZMPs in Odisha did not contain information about revenue (land category and land ownership) details. Common lands in Odisha belong to four different revenue categories. Of these, two categories of village lands are set aside for communal or public purposes and cannot be encroached upon for cultivation or settlement (CPR-Namati 2018). Having access to updated revenue information is central to the identification of public lands and recording their legally permitted uses. For example, the revenue maps of Purunabandha[20] clearly indicated that fish drying areas, the nearby canal, community grave, and parts of the community forest are public lands that cannot be privatised. The language in which CZMPs were produced also rendered it inaccessible to the local fisher community. Not only did the CZMP follow the specialised language of cartography, with coded symbols of keys, colours, contours, etc, but more simply, all maps were in English, a language that very few individuals within fisher communities in the region are fluent in. Despite being produced by the state of Odisha, CZMPs were not available in Odia or Telugu (two languages predominantly used by fishing communities in Ganjam). This serious regulatory oversight severely restricts the ability of fishers to assess the CZMPs against ground realities. In the citizen mapping initiative, we translated all English terms into Odia and provided detailed explanatory text to the manual that outlined how the collaborative mapping was carried out.

Thus, by combining coastal zone details, revenue details, and community generated data, the Odia maps produced by the citizen mapping exercise generated new spatial information hitherto inaccessible to the community. However, overall accessibility of such specialised two-dimensional paper maps still remains limited as the symbols, scale, and design were meant to mirror the CZM plans as mandated by the CRZ legislation, with the objective of revising, updating and reforming CZMPs.

Limits to inclusion in citizen mapping processes

While the Dakshin team aimed to make the mapping process in Purunabandha inclusive by consulting a range of actors

[20] Purunabandha fishing village is a part of the larger revenue village of Pallibandha. It prominently consists of fishers belonging to the Keuta caste (a sub caste of the Kaibarta caste).

within the village,[21] the extent of participation across the main fisher groups within the village was limited due to multiple social constraints. Chief among these was the COVID-19 pandemic which severely restricted mobility and resulted in the Dakshin team having to move the final stages of the mapping exercise to an online, remotely facilitated mode.

Firstly, active fisher women found it difficult to engage actively in citizen mapping. The obvious reason was simply their lack of time away from multiple domestic and other labour. The fisherwomen in Purunabandha and other fishing villages regularly travel to neighbouring districts to sell dry salted fish. In addition to these, they also work as local labourers under the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGA), a national scheme guaranteeing limited days of employment for the rural poor. Most fisherwomen are also part of Self-Help Groups (SHGs) that facilitate microfinance and microenterprise activities (Mondal 2019). Combined with household work and selling fish, this leaves them with very little time to engage in public affairs. Women family members of individuals from the village who were also field staff working on Dakshin's sea turtle conservation activities were more open to collaboration and participated in early key informant interviews and group discussion later that we conducted using Google Meet.

Additionally, women's participation in public affairs lacked wide acceptability. For example, while a few women associated with SHGs attended the meetings we held inside the fishing village, we were told that previous village committee leaders were not in favour of women attending them. Similarly, women's contribution to fishing is often not acknowledged. For example, a study by Das and Rao (2022) on fishing practices and fisheries governance in Ganjam shows that while there are schemes for fishermen, there are no specific government schemes in place to support women fish vendors.

The technology and tools employed for mapping are also significant in deciding the extent of community participation. The GIS technology itself imposed significant social barriers to participation as it required a degree of confidence and prior knowledge of wielding the GPS devices and other tools at our disposal. While comparing paper maps and maps drawn on the ground, Chambers (2006) observed that paper maps are more exclusive with more concentrated power and ownership. Similar concerns can be raised about GIS mapping as well. Even while being mindful of aspects such as who decides how to map, who does the mapping and who owns the map, many concerns such as the digital divide, accessibility of the software and technology, skills required for the application of GIS remain (Elwood 2006). Reflecting on our own experience, due to the COVID lockdown, we had to give up our initial plan to superimpose the revenue map, the data on uses of commons and the CZMP categories onto a base map using GIS software, as a joint exercise with the community members on our mapping team. The missed opportunity for collaborative map preparation as well as lack of access to devices and software made the community dependent on the map makers for future updating. While this by itself does not make the process non-participatory, it underscores the many critiques about citizen mapping. Although the mapping exercise involved fishers from Purunabandha, it could not effectively involve fishers from neighbouring fishing villages for this detailed pilot. In the short period following our own mapping process, fishers from adjacent fishing villages raised apprehensions about the documentation produced by the citizen maps. They were concerned that since they were not part of the process, their usage of shared common spaces could have been misrepresented. While the village committee members of Purunabandha reassured them and offered to share the map with them, this incident also highlights the need for attention to translocal scaling, and adopting contiguous mapping processes involving related traditional fishing communities and other historical coastal (albeit non-fishing) communities in the region.

Citizen mapping has the potential to contribute to coastal protection at village but also larger administrative or ecosystem scales. However, its effectiveness remains limited to localised problems and efforts, unless such mapping relates to broader social or conservation efforts with legitimacy at those scales. One way to achieve this is if such efforts were facilitated as a priority by specialised state and or private bodies tasked with responsibilities and interest in conservation, climate action and sustainable development. The Dakshin team's familiarity with the Ganjam space and the relationships Dakshin built and nurtured since over a decade in this site provided us entry points to support citizen mapping. The ease of replicating such exercises in spaces without such rapport is likely to take far greater effort in building relations of trust and mutuality.

Limited utility of citizen mapping within the CRZ legislation

The citizen mapping exercise generated awareness about provisions of the CRZ legislation and critical knowledge among the participants regarding their customary rights. It has also generated interest among fishers of other marine fishing villages of Ganjam to co-create similar community-based maps which incorporate their customary spaces as well as provisions of the CRZ. In this section, we look at these outcomes as well as the utility of these efforts within limited legal space.

[21] We met with the ward members, village committee leaders (previous and incumbent) and fishing committee leaders. A month later, a community meeting was organised where the mapping proposal was discussed in detail. We then met with various community members to prepare the prompts for the transect walks. Volunteers from the community accompanied the mapping team in the transect walks and pointed out the areas considered as commons.

As an outcome of mapping, some of the participating fishers eventually started referring to the commons as 'our land' as against the unproblematized 'government land'. Such shifts in their outlook have tangible effects which we observed in the course of our work. One night in December 2019, the Ganjam municipality dumped municipal solid waste in Purnabandha's common lands, and announced plans to install a liquid septage treatment plant in the vicinity of these lands, in Purunabandha, without consulting or informing the villagers. The waste was dumped in areas where fisherwomen used to dry fish throughout the year. Subsequently, the community leaders used the coastal zone information provided by the mapping exercise to complain and stop the illegal dumping. They pointed out that the area where waste was dumped was categorised as No Development Zone, a relatively protected category that falls under CRZ 3(B), and that waste processing plants could not be set up in such sites without approval from the Pollution Control Board. They succeeded in stopping this illegal action for a period of time (Venugopal et al 2021).

While community leaders were successful in the above instance, it is doubtful if fisher demands for incorporating community generated information in official coastal planning documents would be heard unless supported by a wider community galvanisation towards this. This limited success of mapping can be attributed to the historically disadvantaged social location of marine fishers and the subsequent social and economic marginalisation that limits their ability to negotiate with formal governance mechanisms. Additionally, as the evolution of the CRZ suggests, participation was not central to its design and still remains an afterthought further limiting the utility of isolated community efforts.

Sustainability of citizen mapping efforts

The continuation of civil society efforts depends on multiple factors, including technological and financial resources, sustaining interest among community volunteers and the ability to see tangible outcomes as a result of these efforts. Shifting base maps can pose a problem for citizen mapping with modest resources. Obtaining accurate and up-to-date maps from state authorities can be a time-consuming affair. Added to this, when critical layers of mapping, such as zonation maps are revised and not updated on official websites and other access points, it can affect the end goal of citizen mapping, which aims at the inclusion of community knowledge and land claims onto official views of the coast. The Purunabandha village committee leaders had planned to get their map authenticated by the panchayat representatives and preserve it as evidence of their uses of the land. However, during the course of the mapping, new CZMPs based on the CRZ 2019 were released. These CZMPs had not taken any input from fishing communities, and neither did authorities make public announcements about them. While the spatial information on the uses of the commons within citizen maps is relevant, the change in the base CZMP is likely to pose technical difficulties with authentication of community maps necessitating further updates using GIS software.

In our mapping experience, the pandemic interrupted our intention to build community capacities on the technical aspects of mapping. Without this crucial skill-sharing component, communities will be rendered unequal partners in collaborative mapping over the long term, depending on external sources for technical support — a likely scenario in geographies where the digital divide is deep. Building capacities also requires regular revision, skill, and knowledge upgradation, not just on technical aspects of GIS mapping and software usage, but also on changes in CRZ regulations, and related questions surrounding land governance.

Lastly, the implementation of the provisions of the law itself can facilitate greater community engagement with coastal regulation and positive climate and conservation action in such vulnerable coastlines. This is illustrated with the CRZ 2019 notification itself, which despite several problematic clauses contains a provision that can boost localised mapping efforts in rural coastal spaces. Annexure 4, section 4 of CRZ 2019[22], states that local bodies and other agencies should use cadastral (village) maps of a scale 1:3960[23] or the nearest scale, as available with revenue authorities, as base maps (MoEFCC 2019, p.49) to facilitate implementation of the Coastal Zone Management plans. This provision however is yet to be implemented in Odisha. If implemented, this provision would boost the capacity of the local self-government to engage with the CZMP as well as improve the accessibility of the maps for citizens. If the creation of local maps can be combined with local citizen mapping initiatives, it would also provide greater legitimacy to both local maps and lend sustained meaning and impact to citizen mapping efforts.

Conclusion

Through this study, we have tried to reflexively examine the scope, utility and sustainability of the coastal citizen mapping initiatives when employed by civil society organisations within the constraints of narrow legal options. Such initiatives, despite their constraints, are also capable of generating accessible spatial knowledge that can be used by communities to engage in evidence-based advocacy for coastal protection.

[22] Annexure 4 section 4(i) states "Local level CZM Maps are for the use of local bodies and other agencies to facilitate implementation of the Coastal Zone Management Plans. (ii) Cadastral (village) maps in 1:3960 or the nearest scale, as available with revenue authorities, shall be used as the base maps. (iii) HTL, LTL, other CRZ regulatory lines and the Hazard line shall be demarcated in the cadastral maps and classifications shall be transferred into local level CZM maps."

[23] Currently, CZMPs are made on a scale of 1:25000.

We have discussed the operation of community governance and legal pluralism among the fishing communities in this stretch of the Bay of Bengal. Fisher governance institutions are also supported by national and state level fishworker unions who have made rich contributions to the coastal protection movement in India. However, they are currently constrained by the dilution of the coastal protection legislation itself, poor implementation of the CRZ regime, weakening of community management and continuing systematic marginalisation.

The coastal regulation zone regime, from the onset, had tried to balance multiple interests including a development imperative. Over the years, the interests favouring business activities had taken priority over those of coastal protection, safeguarding the rights and livelihoods of coastal communities, as evidenced by the multiple amendments and changes introduced in the law. These priorities are also reflected in the core planning document, the CZMP and its preparation. In its current format, the planning process ignores the local ecological knowledge of the communities, their social and cultural uses of the coastal space, and their diverse spectrum of livelihood-related uses. The CZMP documents themselves are inaccessible to the fisher community due in large part to technical jargon in English and the absence of a translated and contextual version in Odiya. As noted by India's CAG, the implementation bodies appear far more concerned with facilitating business activities than improving conservation outcomes or community wellbeing.

While citizen mapping of coastal commons can mitigate these concerns to some extent, their effectiveness is limited in the absence of sustained and scaled up effort, and simultaneously strengthening social mobilisation towards official recognition and facilitation of community rights to coastal commons. The technological capabilities, social position of the fisher community, and resource limitations of civil society organisations also stand in the way of scaling up such mapping initiatives. Compared to substantive legislations such as FRA 2006, whose intent was clearly articulated in one of its objectives — "To undo the historical injustice occurred [sic] to the forest dwelling communities"[24] — the CRZ lends itself to easy dilutions being a delegated legislation. This ambiguous intent within India's dedicated coastal legislation remains a pernicious design flaw that routinely thwarts civil society efforts towards conserving fragile shorelines.

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Declarations

Conflict of interest The authors declare no competing interests.

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[24] https://tribal.nic.in/FRA.aspx

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