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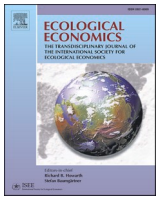

ANALYSIS

Incorporating blue carbon into climate change mitigation policies: Multi-level governance challenges for carbon credits and NDCs

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ABSTRACT

Expectations are high for countries that conserve and restore blue carbon ecosystems (BCEs) such as mangrove forests and seagrass meadows to integrate blue carbon into their Nationally Determined Contributions (NDCs) under the Paris Agreement, or trade blue carbon credits on the carbon market. These expectations are set by international actors steering a blue carbon 'agenda' that attempts to promote and operationalise blue carbon projects as nature-based solutions to mitigate climate change. Yet, across most Small Island Developing States (SIDS) and other coastal nations, project implementation is limited. Through the theoretical lens of multilevel governance (MLG) combined with empirical findings from Fiji, we demonstrate how and why this international agenda is seldom implemented, administratively or in practice, at national and subnational governance levels. Findings reveal challenges such as technocratic methodologies, limited high resolution data, fickle funding priorities, overlapping bureaucracy, limited knowledge sharing, low additionality, and complex Indigenous community structures that problematise the local distribution of financial benefits. We argue that institutional misalignment between governance levels can create a state of 'blue carbon inertia' around credit trade and NDC integration. Moreover, we caution that international inculcation, expertise, and agenda-setting may not always be desired nor effective at lower levels of environmental governance.

1. Introduction

Blue carbon is the carbon sequestered and stored by blue carbon ecosystems (BCEs) such as mangrove forests, seagrass meadows, tidal marshes, and kelp forests. Blue carbon projects involve the trade of blue carbon credits, or the incorporation of blue carbon into nationally determined contributions (NDCs) under the Paris Agreement (Dencer-Brown et al., 2022; Perera et al., 2024). As of May 2023, some 70 market-based blue carbon projects in various stages of development have been identified (Perera et al., 2024). However, only 15 have been registered, and only 11 of those exhibit ongoing credit trade. Notably, just two projects out of the initial 70 identified are in Small Island Developing States (SIDS) – São Tomé and Príncipe, and Timor Leste – both of which remain in the 'project development' stage (Perera et al., 2024). Meanwhile, although global information has been compiled on the blue carbon "NDC actions" of countries (Martin et al., 2016), most of these actions relate to the conservation or restoration of BCEs, which is much vaguer phrasing than specifying the actual carbon removals and emissions reductions targeted or occurring because of such activities. Indeed, as of 2023, only seven SIDS have established quantitative targets related to BCE restoration and conservation and/or blue carbon removals or reduced emissions, while only five SIDS have directly integrated blue carbon into their NDCs (Friess, 2023).

Blue carbon projects have been framed as natural climate solutions (Macreadie et al., 2021), that can contribute to 'low carbon economies' (Steven et al., 2019), and the climate change commitments of SIDS (Delgado-Gallego et al., 2020; McHarg et al., 2022) and other nations (Dencer-Brown et al., 2022; Pham and Le Thi, 2019). This framing is juxtaposed against concerns that carbon removal via BCE restoration, and avoided emissions via BCE conservation, have been overestimated by scientists, oversold by the media, and cannot truly offset fossil fuel emissions (Johannessen and Christian, 2023; Richards et al., 2020; Williamson and Gattuso, 2022). Nevertheless, the blue carbon term has been successful in bolstering financial, research, and practitioner support for the conservation and restoration of BCEs (Wedding et al., 2021). This has led to the operationalisation of crediting projects and/or strong NDC integration in countries such as Australia, India, Indonesia, Mexico, and Senegal (Dencer-Brown et al., 2022; Perera et al., 2024). For many

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countries however, replicating these activities by incorporating blue carbon into climate policy instruments such as NDCs and credits continues to face challenges – especially in SIDS (Friess, 2023; Perera et al., 2024).

Here we, use the lens of multilevel governance (MLG) to show how an array of challenges to blue carbon projects can exist at one governance level, and create or exacerbate further challenges at other levels. This lens is necessary amid an internationally steered 'blue carbon agenda' for coastal nations, and especially SIDS, to deliver outcomes on blue carbon credits or NDCs as part of their climate change mitigation efforts (Song et al., 2021; Thoni and Rummukainen, 2025). Numerous scholars claim blue carbon has "potential" (Bennett et al., 2024; Friess, 2023) to offer "innovative options" (Delgado-Gallego et al., 2020) for "incorporating" (Pham and Le Thi, 2019) blue carbon into NDCs. Amid calls to operationalise blue carbon (Macreadie et al., 2021) and capitalise on its financial interest (Friess et al., 2022), we use our MLG lens to scrutinise *why* this is going to be challenging in some settings. Our study helps address the "depauperate state" of blue carbon social science studies (Atchison et al., 2024), and calls for greater promotion of social science in blue carbon research agendas – which prioritise biophysical, biogeochemical, and geospatial research (e.g., Carruthers et al., 2024; Macreadie et al., 2022).

We aim to evaluate how multi-level governance influences blue carbon credit trade and NDC integration. This is addressed through answering two research questions: (RQ1) What challenges impede the international blue carbon agenda from being realised at national and subnational levels? (RQ2) What do these challenges mean for the practicality and viability of blue carbon credit trade and NDC integration? We identify and scrutinise an array of complex institutional challenges, through an in-depth social science investigation focussing on the archipelagic nation of Fiji. Our social science approach consists of 20 interviews with blue carbon climate policy actors in Fiji, content analysis of documents, and community site visits – all conducted in 2024. This geographical focus is both timely and pertinent, meeting calls for investigations on blue carbon policy (Bertram et al., 2021; Taillardat et al., 2018), and on SIDS (Delgado-Gallego et al., 2020; Friess, 2023; Pham and Le Thi, 2019). The 58 SIDS – which are increasingly being relabelled as Large Ocean States – share similar geographical, economic, and institutional characteristics, as well as being common recipients of climate finance (Delgado-Gallego et al., 2020). Therefore, Fiji is representative of many SIDS and other countries that have developed action plans for BCE conservation and restoration, but not yet engaged in blue carbon credit trade, nor the integration of blue carbon into NDCs (Friess, 2023; Perera et al., 2024). Ultimately, we show how institutional misalignment within and between levels of governance creates and maintains a state of 'blue carbon inertia' around credit trade and NDC integration.

2. Theoretical framework and study context

2.1. Multi-level governance theory

Governance is typically defined as the institutions, structures, and processes that determine who makes decisions, how and for whom decisions are made, actions that are taken and by whom, and to what effect (Lockwood et al., 2010). *Institutions* include both the formal (e.g., constitutions, laws, policies, tenure systems) and informal rules (e.g., cultural customs, social norms) that shape human interactions (North, 1990). *Structures* include formal bodies (e.g., co-management bodies) and organisations (e.g., international organisations, government ministries, civil society organisations). *Processes* refer to the actions of governing, such as diffusing information, forming policies, and implementing them. Much research on governance in the environmental context focusses on analysing how responsive, robust, equitable, and effective governance is at delivering positive ecological and/or social outcomes (Bennett and Satterfield, 2018; Wyborn, 2015). Importantly, environmental governance should also involve local and Indigenous communities to help deliver these outcomes (Brondizio and Tourneau, 2016).

Partelow et al. (2020) categorise eight theories of environmental governance present in the academic literature. In this article, we draw on multi-level governance (MLG) theory, which analyses how well governance processes are integrated (1) vertically between levels, and (2) horizontally within levels (Fig. 1a). Vertical integration is the extent to which higher-level concepts and polices emanating at the international level are (or are not) implemented, administratively or in practice, into lower governance levels. The international level includes organisations that work in multiple countries (e.g., Conservation International), and supranational organisations that represent multiple states globally or regionally (e.g., the Pacific Islands Forum). Lower levels include national and subnational levels, the latter of which includes provincial, district, and local levels. MLG hypothesises that stronger vertical integration between levels increases the effectiveness of environmental governance (Partelow et al., 2020). Horizontal integration regards interactions between actors occupying the same governance level, such as national government ministries or international conservation organisations (Partelow et al., 2020). MLG also places attention on agency and the flow of information among actors between and/or within levels. Use of MLG is advocated when analysing new or understudied institutional spaces, such as that around blue carbon (Partelow et al., 2020; Walker et al., 2022).

MLG is under-utilised but well-suited to investigating blue carbon governance. BCEs are often associated with stakeholders at multiple governance levels and sectors (public, private, civil) that can form an array of governance structures (from top-down to bottom-up) (Ayostina et al., 2022; Contreras and Thomas, 2019; Ewane et al., 2025; Merk et al., 2022; Thompson, 2018; Thompson et al., 2017). They can experience overlapping legal arrangements, whereby they are classified as either terrestrial or marine ecosystems, or both, and administered by multiple government agencies (Ayostina et al., 2022; Friess et al., 2016). BCEs can also have unclear tenure and ownership rights, including those regarding the customary rights of Indigenous people (Merk et al., 2022; Stewart-Sinclair et al., 2024). As a result, blue carbon credits and NDCs are also inherently tied to policies and institutional frameworks that transcend governance levels – and thus "need to be managed through a multi-level governance regime involving co-management and local participation" (Thompson et al., 2017). Indeed, the involvement of local people in planning blue carbon projects is particularly important (Ewane et al., 2025; Merk et al., 2022).

Despite the importance of MLG in successfully restoring and conserving BCEs, and operationalising blue carbon projects that trade credits or are incorporated into NDCs, few MLG studies on blue carbon exist (Walker et al., 2022). Some previous literature has focussed exclusively on the subnational level (Merk et al., 2022; Thompson et al., 2014; Wedding et al., 2021), some on the national level, but without idnetifying connections with the international and subnational levels (Ayostina et al., 2022; Xu et al., 2023), and some on multiple levels but which focussed on only one actor type (Schröter et al., 2018). We fill this research gap by contributing empirical social science on blue carbon credits and NDCs, that analyses international, national, and subnational governance levels in tandem (Fig. 1a).

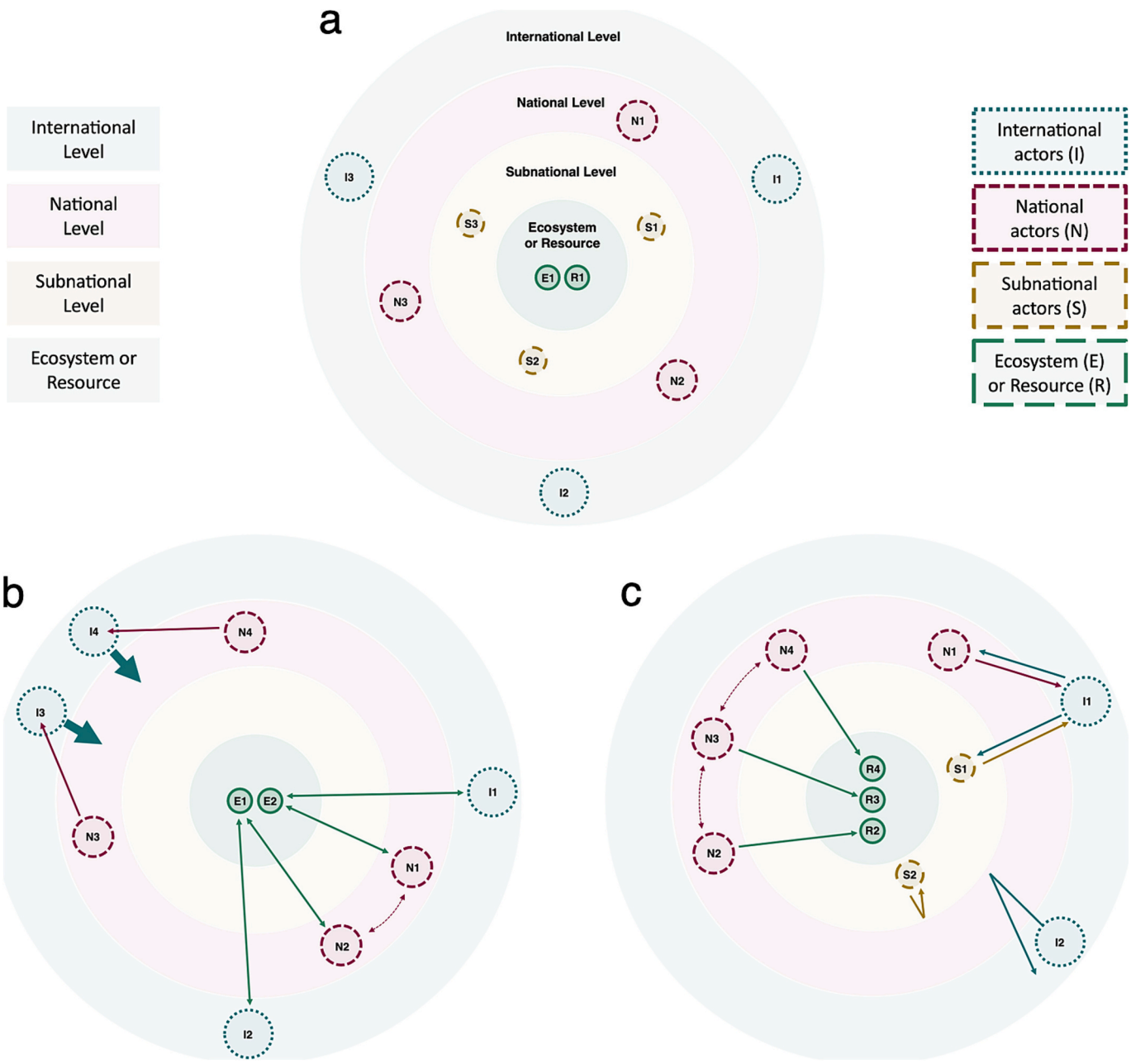

Fig. 1. Conceptualisation of the empirical findings based on multi-level governance theory. (a) Depiction of multilevel governance theory showing the international, national, and subnational levels – and typical actors within – that collectively govern a particular ecosystem (e.g., mangrove, seagrass) or resource component within an ecosystem (e.g., land, biomass, carbon). (b) Depiction of absent (I1-I2) or limited (N1−N2) data sharing, and resulting duplication of data gathering on BCEs (e.g., by N1 and I1); the top-down inculcation of the 'blue carbon agenda' by international organisations I3 and I4; and, the use of international consultants by national ministries N3 and N4, which may be a condition of any international funding received. (c) Depiction of multi-level partnerships needed between international (I1), national (N1), and subnational (S1) actors; how a lack of consent from subnational actors with land ownership rights can impede action from those at higher governance levels (I2); and how subnational actors can experience a lack of responsiveness from national actors (S2); Depiction of overlapping bureaucracy among national government actors (N2, N3, N4) with each responsible for a particular resource component within the same ecosystem. NB: the abbreviations used in this figure and caption (I, N, S, E, R) are only relevant here and are unrelated to the codes used to anonymise and categorise individual interview respondents (G, O, C, A) which exist in Table 1, Supplementary Table S1, and throughout the main text of Section 4. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

2.2. The blue carbon agenda, credits, and NDCs

It is important to acknowledge that there exists a 'blue carbon agenda[1]' comprised of international actors and coalitions (Song et al., 2021; Thoni and Rummukainen, 2025) that are driving what Atchison et al. (2024) call the "rush to operationalise blue carbon". As with any agenda, those driving it exert influence on governments through persuasion, inducement, and agenda-setting (Dahl, 1961; Morrison et al., 2019). Specifically, this includes the involvement of these actors in objective-setting, policy guidance, technical assistance, financial allocations, and partnership development (Morrison et al., 2019; Nagendra and Ostrom, 2012). For example, the Blue Carbon Initiative, International Partnership for Blue Carbon, Global Blue Carbon Coalition, and Blue Carbon Accelerator Fund, are just some international endeavours aiming to support the development of blue carbon projects by fulfilling all or many of these roles (Feng et al., 2023; Friess et al., 2022; Satizábal et al., 2020; Song et al., 2021). Additionally, most large international conservation NGOs have dedicated blue carbon programmes. As Song et al. (2021) state, "the conventional global-to-national spread of policy ideals has been vigorously underway via international coalitions through multilateral negotiations or via bilateral assistance… Blue carbon is no exception in this regard". Currently the blue carbon agenda gravitates around two distinct climate mitigation policy instruments: blue carbon credits and NDCs.

Regarding credits, there exist compliance and voluntary carbon markets through which carbon credits can be issued and traded. Compliance markets exist for countries and corporations mandated to buy carbon credits to meet emissions targets set through the Paris Agreement of the United Nation's Framework Convention on Climate Change (UNFCCC) (van der Gaast et al., 2016). Meanwhile the Voluntary Carbon Market (VCM) exists for governments, corporations, non-governmental organisations, and individuals to buy carbon credits to meet voluntary goals, such as achieving net zero. The VCM is dominated by a handful of standards that provide methodologies and verify and issue carbon credits. The VCM is the most viable option for trading blue carbon credits, with the dominant standards being administered by Verra and Plan Vivo (Friess et al., 2022; Perera et al., 2024). Notwithstanding the financial cost of having blue carbon credits certified through the likes of Verra, the presence of these ready-to-use methodologies and guidelines suggests that other governance challenges are impeding progress on transitioning from BCE conservation and restoration towards actual blue carbon credit trade (Ayostina et al., 2022; Merk et al., 2022; Schröter et al., 2018; Xu et al., 2023).

Regarding NDCs, the Paris Agreement stipulates that each signatory submits 'Nationally Determined Contributions' – a pledge of the mitigation measures that it will take to help prevent the global temperature increase exceeding 1.5 °C above pre-industrial levels. Protecting and restoring BCEs represent one potential way for a country to deliver on its NDC pledge – alongside efforts on e.g. renewable energy (Taillardat et al., 2018; Walker et al., 2022). In addition to a handful of articles that review the extent to which blue carbon features within the NDCs of a particular set of countries (Delgado-Gallego et al., 2020; Friess, 2023; Pham and Le Thi, 2019), a couple of national case studies exist for SIDS. For example, in Grenada, BCEs were found to have been promoted in climate change adaptation strategies to build resilience, but not in mitigation strategies (McHarg et al., 2022). Meanwhile, Belize was found to have recently modified its NDC to include blue carbon as part of their contribution (Arkema et al., 2023). Yet, qualitative social science investigations on the process of integrating blue carbon into NDCs are lacking.

Article 6 of the Paris Agreement allows a country that has achieved its own NDC goal to voluntarily cooperate with another country by transferring carbon credits to the recipient country, thus helping that country achieve its own NDC goal (Wetterberg et al., 2024). This is known as an Internationally Transferred Mitigation Outcome (ITMO) and requires a 'corresponding adjustment' to be made to avoid double counting the same credit in both NDCs (Wetterberg et al., 2024). Ultimately carbon credits that contribute to NDCs or are traded between countries as ITMOs represent compliance mechanisms, whilst carbon credits traded with support from the various standards within the VCM represent voluntary mechanisms. Thus, these represent public and private pathways to achieve the same goal of emissions reductions and/or carbon removals.

2.3. Study location: Fiji

The Republic of Fiji is a SIDS located in the South Pacific Ocean, comprising a population of around 930,000 people. Fiji has two BCEs: mangrove forests and seagrass meadows. Cameron et al. (2021a) estimate the current extent of mangroves in Fiji is 65,243 ha – one of the largest mangrove areas across the Pacific Island Nations. Between 2001 and 2018, this decreased by 0.11% annually (Cameron et al., 2021a) due to degradation caused by tropical cyclones, and deforestation due to land use change – particularly the expansion of sugarcane farms and urban development (Veitayaki et al., 2017). Singh (2019) indicates that seagrass species in Fiji have high potential for carbon sequestration, but according to Brodie et al. (2020), previously recorded estimates of seagrass extent are extremely unreliable.

The Indigenous people of Fiji, the iTaukei, own 83% of the land – also known as native land (Naidu and Reddy, 2002). The state owns 9%, and the remaining 8% is freehold land. Native land in Fiji can only be leased for a particular period and it cannot be sold (Sloan and Chand, 2016). Moreover, Fijians of other origins require the permission of the relevant iTaukei tribe to access and/or use particular areas and their resources. For example, the Fijian government recognises 410 iTaukei communities that have customary rights to foreshore areas and the marine ecosystems within, which are termed iQoliqoli rights – and would often include BCEs (Sloan and Chand, 2016). This is pertinent given calls for further research on the social and cultural dimensions of blue carbon governance at the subnational level, especially land and resource ownership and traditional customs (Atchison et al., 2024; Contreras and Thomas, 2019; Merk et al., 2022; Walker et al., 2022). As noted in the Introduction, Fiji presents a timely laboratory to test theories of MLG governance as applied to the thematic context of BCEs, blue carbon credits, and NDCs.

Fiji is also a signatory to an array of integrated regional agreements such as the Pacific Islands Regional Ocean Policy (PIROP), Framework for a Pacific Oceanscape (FPO), and 2050 Strategy for the Blue Pacific (Vince et al., 2017). While these do not mention blue carbon specifically, they do acknowledge the need for ocean and coastal ecosystem conservation and restoration – and regional cooperation to this end. One example of this in action is the 'Management and Conservation of Blue Carbon ecosystems in Pacific Island Countries (MACBLUE)' Project currently being undertaken in Fiji, Papua New-Guinea, the Solomon Islands, and Vanuatu with regional coordination provided by the Secretariat of the Pacific Regional Environment Programme (SPREP). Another is the 'Mangrove Ecosystems for Climate Change Adaptation & Livelihoods (MESCAL)' Project which was undertaken in Fiji, Samoa, Solomon Islands, Tonga and Vanuatu from 2009 to 2014 (MESCAL, 2013). Ultimately, with Pacific SIDS typically operating by consensus through regional agreements (Vince et al., 2017) and engaging in regional-scale environment and development projects, our data from Fiji likely has relevance to Pacific SIDS more broadly.

[1] We use the term 'agenda' to describe the influence or determination of international actors to pursue blue carbon science, policy, and project development. While many agendas are political and self-serving, we primarily use the term to stress (1) the importance of acknowledging that there *is* an international agenda on blue carbon – given our focus on MLG, and (2) that it is important to investigate *why* pursuing this agenda may be more warranted in some places than others.

3. Methods

Methodologically the research is grounded in constructionism, which takes an epistemological approach to understanding the opinions, norms, and values of society (Ritchie et al., 2013). The research is also inductive in nature with the empirical data analysed to identify patterns that can connect to MLG theory. The constructivist theoretical position allows for various approaches to data collection. The ones used for this study include semi-structured interviews, document analysis, and field observations – akin to previous blue carbon social science investigations (Ayostina et al., 2022; Quevedo et al., 2021; Schröter et al., 2018; Xu et al., 2023). Field observations included visiting current BCE restoration sites and community-driven conservation sites – including some sites of the MACBLUE Project. Document analysis included procurement from government ministries and/or other organisations in-country (Xu et al., 2023).

Semi-structured interviews are a longstanding social science method for qualitative data collection as they provide interviewees with a certain level of freedom to express their thoughts and emphasise their perspectives in certain areas of interest within a specified topic – in this case BCEs, blue carbon credits, and NDCs. Some 20 semi-structured interviews were conducted, with the majority of these undertaken in-person in Fiji during Q1 2024. Interviews primarily took place at the respondent's office in the capital city of Suva, or a village community space. Due to the unavailability of some targeted respondents seven were conducted online via Zoom (Table 1). All interviews were audio recorded and manually transcribed. The data collected were in both Fijian and English; data collected in Fijian was transcribed with the help of a translator. All respondents were assured of their anonymity.

To ensure the relevance and richness of the data, purposive sampling was employed. This involves selecting specific individuals that are most capable of providing information to address the aim of the study (Ritchie et al., 2013) – in this case, knowledge and opinions on the blue carbon policy environment in Fiji. These respondents were identified through Internet searches and prior in-country contacts. Additionally, snowball sampling was used to expand the number of relevant participants – whereby existing study participants assist in identifying additional participants to be interviewed. In addition to the above sampling techniques, it was ensured that the sample was sufficiently stratified – encompassing individuals from different respondent groups. Respondents included representatives from different governance levels: *international level* (international NGOs), *national level* (Fijian government ministries, Fiji-based academics), *subnational level* (local communities) (Table 1).

Table 1
Respondent information and anonymised codes.

Respondent type	Description	Number	Codes
Government	Senior position officials from all five ministries that are involved in the governance of BCEs.	6	G1 to G6
NGOs	NGOs that work directly on blue carbon projects which are in a high position in GIS mapping, informing policy and/or research and management of blue carbon projects. This includes individuals that work or worked on the MACBLUE and/or MESCAL Projects.	6	O1 to O6
Organisations (private entities)	International organisations whose work is connected to blue carbon, governance of blue carbon, and climate finance.	2	O7 to O8
Community	Village headman who is directly involved in communicating with the government on behalf of the community; Women's community group that connects with other women's community groups; Older and younger members of the community.	4	C1 to C4
Scientists / Academics	Scientists and/or Academics who are directly involved in blue carbon work in Fiji, either independently or as consultants for some of the international NGOs.	2	A1 to A2

Interview questions sought information on topics such as (1) the position of the respondent within the given organisation, ministry, or community (2) knowledge of BCEs and blue carbon policy, as well as project specifics related to blue carbon (3) the extent of interactions and relations with other stakeholders involved in blue carbon in Fiji (4) specific views on blue carbon credits and NDCs. With the local communities (who could not necessarily be expected to have prior knowledge or awareness of 'NDCs' and 'credits') questions focussed more on interactions with actors at higher governance levels, and the management of their BCEs. Some community interviews were conducted in a group of similar respondents (e.g. Woman's Association), totalling 18 respondents across the four community interviews.

Raw data elicited through the interviews were initially analysed by identifying key themes and perspectives that interviewees mentioned. Open and selective manual coding was then undertaken whereby a list of codes were identified based on words and concepts frequently mentioned in the interview transcripts (Merriam and Tisdell, 2009). These codes and their saturation are shown in Supplementary Table S1. Transcribed data was imported into the online qualitative data analysis platform, NVivo, to sort and categorise relevant quotes based on these codes. Coded interview excerpts were exported, ordered by their code, and representative excerpts were used in the Results section.

4. Results

The Results are structured by issues that manifest between the international and national levels (Section 4.1), and those that manifest between the national and subnational levels (Section 4.2). This enables us to use our empirical data to demonstrate how the international blue carbon agenda is impeded at lower governance levels. Throughout, we depict how our empirical findings are conceptualised within MLG theory (Fig. 1b and c).

4.1. International-national level issues

4.1.1. International inculcation versus national hesitancy

In keeping with the blue carbon agenda, several international NGOs have been instrumental in introducing the nation of Fiji to the concept of blue carbon (Fig. 1b). Document analysis shows some international NGOs are actively working to enhance the viability of carbon trading by publishing reports such as 'Blue Carbon in Fiji: Carbon Rights Assessment and Benefits-Sharing' which promotes the value of BCEs and suggests conditions that could make carbon trading viable in Fiji (CI, 2023a). Additionally, a report titled 'Blue Carbon Trading for Fiji' underlines the necessity of building capacity (CI, 2023b). Speaking about the current MACBLUE Project, one respondent explained, "Our [MACBLUE] project mainly deals with blue carbon… We approach policymakers… basically saying this is what this [BCE] is worth [and so] you must do something to protect this. So with that incentive, new policies can be made… to conserve these ecosystems. That's the end goal of this project" (O1). Similar evidence of top-down inculcation has occurred for related conservation financing approaches such as payments for ecosystem services (Thompson and Harris, 2021). Nevertheless, although common, our results reveal that this internationally led blue carbon agenda creates governance challenges between the international and national levels of governance.

The promotion of blue carbon incorporation into NDCs from those

outside Fiji (Fig. 1b), led to hesitancy at the national level. Currently, "Fiji's NDCs is very much focused on just the energy and the transportation sector" (O2), with another respondent stating, "We haven't really thought about including that [blue carbon] in the upcoming NDC [due in 2025]" (G4). Another concurred the NDC "doesn't necessarily talk about blue carbon… it gives a very general understanding of blue economy and oceans as a carbon sink…. [but] it certainly is quite ambiguous" (O5) – as corroborated in the academic literature (Cameron et al., 2021a; Pham and Le Thi, 2019). This hesitancy was partly due to awareness of carbon credits as a potential revenue stream for communities and/or government. Yet, Article 6 of the Paris Agreement stipulates that any ton of blue carbon included in an NDC cannot be sold through the VCM. Some respondents were concerned about this, saying "The issue is if it's included in the NDCs, then Fiji cannot trade [that same] carbon" (O2), and "Once it becomes in the NDC, you can't trade [that carbon]" (O6). Hence, since Fiji is yet to trade any blue carbon credits, there has been inertia on integrating blue carbon within Fiji's NDC because doing so would remove the option of future credit trade once sufficient subnational data and know-how is realised.

Rather than the NDC route, respondents did advocate for blue carbon to be included in other national policy. For example, the 'Low Emission Development Strategy (LEDS)' published by the government outlines various methods to reduce emissions in Fiji from 2018 to 2050, and does specifically mention blue carbon and BCEs (Supplementary Table S2). Seven respondents advised incorporating blue carbon into existing National Policy such as the Climate Change Act or the Environment Management Act, or even adding it to Fiji's REDD+ Policy to help facilitate credit generation and trade. Six respondents suggested a new blue carbon policy would be needed "before we can legally trade it" (A1), and others noted that "blue carbon is still very much voluntary in terms of the market and trading… not mandatory [which…] might also be an explanation as to why this hasn't really [been] cracked" (O8). However, some were against the creation of new policy on the grounds that such policy may be difficult to implement. For instance, one respondent shared, "There's no point in coming up with new legislation or new policies… when you're not able to enforce it… there's no point" (G6).

4.1.2. *Fickle international funding produces siloed and duplicated national data*

International financing for BCE research, restoration, and conservation in Fiji was considered to be reasonably high, with an array of donors mentioned. Yet while national-level respondents perceived good availability of funds from international donors for blue carbon work, they lamented the conditions it came with, indicating a lack of coordination among those donors. One respondent expounded, "as a developing country, we sort of fall prey to the conditions set by those who sponsor these projects. And it's never in continuity [considering previous work…] so whatever project money we get, the conditions that come with that are the conditions we [must] follow" (G2). This situation can lead to the duplication of (sub)national data collection, according to another respondent, "At the end of the day, what happens is, project investments come into the country, and then we end up doing the same thing over and over again" (O3).

These results corroborate perceptions of discoordination and fickleness among and between international conservation practitioners and donors (Sanders et al., 2021), leading to duplicated or discontinuous project efforts (Fig. 1b). Our findings demonstrate that (sub)national BCE data collection in Fiji does not follow a standardised process, nor is it well collated or shared. This is primarily because many international NGOs employ their own methodologies (or follow different international guidelines/standards). This leads to siloed operations among these organisations, potentially compounding these issues of data duplication and resource wastage. As one respondent explained, "we undertook [a blue carbon assessment…] but the same thing was also being done by [another organisation] under their blue carbon program… it's a duplication of work – it's a waste of time" (O3).

The UNFCCC's Intergovernmental Panel on Climate Change (IPCC) categorises climate data in three 'Tiers' based on its quality. Tier 1 is the cheapest and lowest quality (coarsely modelled estimates with minimal subnational empirical data) and Tier 3 is the most expensive and highest quality (subnational data on actual carbon emissions, emission reductions, and/or sequestration). A respondent explained, "Gathering Tier 2 and Tier 3 data is expensive and for small countries in the Pacific – to do that data would be the entire budget of [for example] The Ministry of Health. So, we have to make do with what we have" (O5). Such observations are significant because conforming to the stringent methodologies of international organisations such as the IPCC (plus other verifiers such as Verra and Plan Vivo) is very costly and technocratic (Sapkota and White, 2020). For example, an international-level respondent involved in the MESCAL Project explained, "We engaged with the governments in all those five countries where MESCAL was implemented and that's what I really liked about that project. It was very much with the *technical personnel* from the relevant government ministries" (O3, emphasis added). It is worth noting that while the development and promotion of these standards is important for ensuring the integrity of climate policy and action, their use is essentially mandated if BCEs are to generate credits or contribute to national GHG accounting; for example, one respondent stressed, "[If] you put blue carbon in the NDC it has to be verifiable [so…] you're not just putting it down for the sake [of it]" (O6). This point connects Sections 4.1.1 and 4.1.2 since national hesitancy around whether to incorporate blue carbon into Fiji's NDC will both influence, and be influenced by, the funding and technical expertise available to accurately perform blue carbon accounting – which segues into Section 4.1.3.

4.1.3. *National capacity limitations versus the (un)importance of international expertise*

Findings suggest there is incapacity within government agencies – which lack human resources, technical expertise, and monitoring capabilities for effective BCE management. A national government representative explained, "Fijian civil service… we are limited in human resource and technical capacity, and we have a high human resource turnover meaning people come and go… So that becomes an issue" (G1). This high turnover was corroborated by another respondent who said that ministerial teams are often "new" teams, claiming that two years into one of their BCE projects, "only four out of about 30" of the original ministerial employees remained (O3). Despite the term 'blue carbon' being coined in 2009, in Fiji it was also perceived as very new; for example, a representative from an organisation explained that when talking about mangroves with government they "seemed confused [and…] haven't really caught up with blue carbon" (O3) with another noting this "archaic knowledge" (G5). Another spoke about how at an inception workshop for the MACBLUE Project the idea of seagrass being suitable for blue carbon "hadn't featured on their [the government's] radar" (O3). This is challenging when technical decisions are needed around exactly how blue carbon can be leveraged in Fiji's national policies. It underscores the need to raise national capacity among Fijian people such that they can gain agency in blue carbon discussion and action.

Some respondents felt the top-down and technocratic blue carbon agenda was partly related to post-colonial hang-ups that reinforce an apparent need for international experts to work on blue carbon in Fiji – despite the perceived presence of competent local experts (Fig. 1b). While the use of international expertise is common in many sectors across many countries, there was a feeling – even among some of our foreign respondents – that an over-reliance on international expertise tips the cost-benefit scale of projects unfavourably, especially when expensive foreign consultants are used. One respondent stated, "Being in a developed country and being a colonised country for that matter, I think the mindset and the thinking is that we are inferior to those from abroad. And whatever they bring is considered gospel truth… [Yet] we have found problems now in terms of the legislations and the

governance [regime] that has been set by others for us" (G2). Speaking specifically about a project on BCEs, another respondent bemoaned, "The verification for that [project] was undertaken by an international consultant, which cost the project a lot more. So, the initial setup of the project became very high because of it" (O3). While international expertise undoubtedly bolsters Fiji's blue carbon capabilities in the short-term, greater scrutiny of the necessity and cost-benefit of these may be warranted to restrict what appears to be an example of what Büscher and Fletcher (2019) term "privatised expert technocracy" lingering long-term.

4.1.4. National bureaucracy impedes the international agenda

Through the internationally driven MESCAL Project, in 2013, a Mangrove Management Committee (MMC) was established, with the initial remit of updating Fiji's 1985 Mangrove Management Plan. However, despite a suggested update being drafted in 2013, this is yet to be endorsed or ratified by government. Respondents felt this was due to there being "a lot of hands in the pot, because there are overlapping authorities that work with mangroves" (G2). Indeed, Fiji's institutional framework for blue carbon exhibits overlapping bureaucracy, with each component of a BCE falling under the remit of a different government ministry (Table 2). No single governing body has oversight, meaning ministries – akin to their international counterparts – operate in silos, often prioritising their own strategic interests rather than cooperating to strategise on blue carbon law, policy, and practice (Fig. 1c). As such, any action on blue carbon requires consultations with five separate ministries – and this, in and of itself, can create inertia, as exemplified by this respondent: "If there is a bit of a grey area, then they [ministries] tend to push it [work on blue carbon] aside" (G6).

Respondents spoke of "competing interests" (G6) among the ministries with each focussing on objectives stipulated in the legal Act relevant to them (Table 2). While these Acts were drafted long before the 'blue carbon' term was coined, components of BCEs and/or blue carbon feature implicitly across these Acts and are thus the responsibility of different ministries. A respondent noted, "each ministry was competing with each other, [and] competing for outputs in their sector, so they weren't really working together" (O3), while another spoke of "territorial issues" (G6) between ministries such that they want to "protect their own turf" (G6). One respondent provided an example related to the Reducing Emissions from Deforestation and degradation (REDD+) Programme: "During the REDD+ program, mangroves were initially not listed as forests. They said, 'Oh, it's the responsibility of the Ministry of Fisheries or the Ministry of Environment.' However… all of that is being reformed again" (O1). The following paragraph further elucidates how this situation hinders progress on blue carbon policy.

Somewhat ironically, respondents felt the updated Mangrove Management Plan – overseen by international actors through the MESCAL Project – has not addressed the ambiguity around ministry roles: "Even in the new regulation [Plan], there is no clear indication as to the roles of the environment agencies… I feel like there would be greater confusion [if it came] into force" (O3). Furthermore, the Mangrove Management Committee Chair was arbitrarily transferred from the Ministry of Lands to the Ministry of Environment and Climate Change. Yet, respondents explained that no ministry represents a suitable choice since, for example, "As much as the [Ministry of] Environment [and Climate Change] wants to protect the mangrove for the services it provides when it comes to carbon sequestration, it sits on state land which comes under the [Ministry of] Lands" (G6). Ultimately, the Committee has been largely inactive under each ministry's leadership, with respondent recollections indicating just one meeting in 2018 and one in 2023, since 2013. Relatedly, there were also mixed views on the MMC as an overarching body: "you don't want to create bottlenecks, and having one overarching management body tends to create bottlenecks… [we need] some sort of mechanism to bring all these stakeholders together, without creating a big photocopier" (O4). This all demonstrates how inertia on the part of the government in not ratifying the new Plan, can cause inertia among national civil society groups, such as the MMC, to the frustration of those pushing the international blue carbon agenda.

Table 2
Components of BCE governance, the ministry responsible for governing, and the act that guides that governance. Based on MESCAL (2013), Singh (2019), Sloan and Chand (2016). See also Supplementary Table S2.

Component being governed	Ministry responsible for governing	Relevant Act
The land or foreshore within which the BCEs are located	**Ministry of Lands and Mineral Resources** oversees the licensing of foreshore land.	The State Lands Act 1945
The BCE itself	**Ministry of Forests** undertakes licensing of commercial use of mangroves for firewood and timber.	The Forestry Act 1992
Resources associated with BCEs	**Ministry of iTaukei Affairs** protects the rights of iTaukei people and any BCEs within their foreshore waters	iTaukei Lands Act 1905 iTaukei Land Trust Act 1940
Policies and management strategies related to BCEs	The **Ministry of Environment and Climate Change** are responsible for mandating Environmental Impact Assessments (EIAs).	The Environment Management Act 2005
Any commercial fishing that might take place in the Mangrove / foreshore area	The **Ministry of Fisheries** issues licenses to commercially fish	The Fisheries Act 1995

4.2. National-subnational levels issues

4.2.1. Ambiguity at national levels due to complex subnational tenure rights

As with many SIDS, Fiji has a complex land tenure system encompassing customary rights held by Indigenous people. Some respondents felt this complexity creates reluctance to including blue carbon into the NDC, with one respondent acknowledging, "I think it's because of the land tenure issue that it [blue carbon] was never included in the NDC" (O2). This complexity often slows down project implementation and creates obstacles as echoed by a different respondent, "some of our challenges are… around land issues and the rights of communities… they have strong rights… [which creates] bottlenecks in trying to implement any project" (G4). Another government respondent explained, "although we have access to the state land where the mangroves are, in order to reach them, we have to cross a boundary of the native land. This requires permission from the people [iTaukei community] so, if they are not in agreement with what you are proposing, it [gaining access] becomes an issue" (G1). Of the MACBLUE Project, a respondent said, "we have our own criteria of assessment. For example, accessibility to the site, because most of the land is… traditionally owned so appropriate permissions are required, so if [that criteria] is met, then we choose the project site" (O1). This demonstrates that international actors are not only impeded by the international-national level challenges revealed in Section 4.1, but may then also be impeded at the subnational level, should iTaukei communities be unwilling to collaborate with them and/or national government (Fig. 1c).

This is also significant in the case of blue carbon credits, with one ministerial representative explaining, "to fully understand the scope [potential] of [carbon] trading… you need to formulate something that is suitable and appropriate for our iTaukei community….something that covers their ownership rights" (G3). In-keeping with Section 4.1.4 around ownership of different BCE components, inertia was created by ambiguity about the ownership of carbon credit benefits, as epitomised by this quote, "if you were to do a blue carbon project, any benefits that will be realized from the sale of carbon – will you give it to government because they own the mangrove, or will you give it to the communities because they have ownership rights [over the land]?" (O6).

Should such revenue be distributed to communities, iTaukei

community structure creates further inertia because of the perceived complexity and/or futility when benefit sharing (i.e., distributing credit revenues). Since the entire *Matanqali* (tribe) own the land, the amount of revenue from carbon credit sales for individual community members would typically be small, with this situation exacerbated by the fact that many BCE areas in Fiji are small. One respondent noted, "With a blue carbon space, an area of about 1000 square kilometres, can be owned by more than 70 or 80 land-owning units (tribes)… So those are the complexities… [benefit] sharing it doesn't make any sense" (O5). This was corroborated by another respondent who explained that any blue carbon revenue coming "into the country through the project, still needs to be shared amongst all of them [tribes and/or individuals with each tribe…] So a very small site will generate a very small profit in that sense" (O2).

4.2.2. Weak national support towards subnational actors and low knowledge sharing

Blue carbon inertia further manifests from reportedly weak relations between subnational communities and national government. Our findings revealed that subnational actors felt support from government is "very weak, we don't have any relationship with the government… the support from government is very little" (C2). The aforementioned incapacity of many ministries (Section 4.1.3) means national government can seldom respond promptly and meaningfully to local requests or concerns on BCE management. Respondents from local communities told anecdotes of outsiders felling mangroves near their villages and the longwinded administrative processes required to receive government support. Requests for wardens and boats for monitoring and enforcement required writing letters that "first must go to the district meeting, then provincial meeting, and to another meeting and then the [national] government. They must go through all this process to reach the [national] government" (C1). Others said, "Some issues take time for the government to meet the community's request" (C3) and that "the only time we get to communicate with them [government] is when they come here for some meetings, once they go back, we can't interact with them" (C4).

These quotes of dissatisfaction from subnational actors towards national actors are inconducive towards effective BCE management, let alone blue carbon projects that would require communities to grasp the concept – which cannot be guaranteed given its technocratic framing (Section 4.1.3). Filho et al. (2024) note that within SIDS "the (uncritical) privileging of Western/science-based knowledge in climate change… often contrasts sharply with the worldviews of local residents" – and that was apparent here. For example, one respondent noted that during a stakeholder meeting on coastal resource management, an attendee from a local community thought that blue carbon was "something which we're going to pack in a bag and then send it overseas to be sold" (O2). Furthermore, interviews with a member of the community where the MACBLUE Project was occurring showed that levels of awareness could be greater: "I am not directly involved but am aware of it [MACBLUE]. I know a little bit of it; the seagrass restoration and planting, and that they come here to assess [which of] three methods of planting… will succeed" (C3). Uniting this and Section 4.2.1, it is apparent that unclear and unconfirmed benefit sharing will further exacerbate this situation of dissatisfaction with national government, lack of knowledge sharing between governance levels, and/or limited subnational awareness of blue carbon projects (Fig. 1c).

4.2.3. Few subnational drivers mean national BCE loss is low

Some localised drivers of BCE degradation were cited by our respondents and included "land development and industrialisation" (O4) including the high-profile construction of a new yachting marina, "illegal waste dumps" (G6), and "dredging" such as that around Suva (A2). However, the majority thought risks to Fiji's BCEs were minor, as this respondent explained: "There's not like the big significant ongoing drivers of deforestation to warrant the investment required for a full-scale blue carbon project… to generate those carbon credits – it's not worth what you get in return as a product" (A2). One respondent acknowledged that this is because at subnational levels, BCE management in Fiji is underpinned by traditional custodianship, "I think the beauty of Fiji is that before the whole term about NbS [Nature-based Solutions], blue carbon… was even coined people were already inadvertently practising NbS … [It is called] TEK [traditional ecological knowledge]. So, it's ingrained within them [iTaukei communities]" (O7) – supporting research demonstrating that the iTaukei people have managed mangroves effectively for generations (Pearson et al., 2020).

This is significant in the context of the 'additionality' concept – whereby it must be proven that emissions reductions delivered by a conservation intervention would not have occurred without it. A respondent bemoaned, "unless there is a driver of deforestation to avoid in the first place, then you can't turn that into carbon credits. To put it crudely, the way the markets work is that you can't get paid to be good land managers, which is basically a sham" (A2). Notwithstanding this additionality issue, respondents also felt that BCE coverage in Fiji is too small to establish a national carbon accounting or a crediting system for blue carbon, "There are small pockets of restoration opportunity available… but their significance in terms of the scheme of things under the whole ambit of nationally determined contributions would remain to be seen" (A2). It was also stressed that most individual BCE areas are not large enough to justify credit calculation and trade at a subnational project-by-project basis due to high transaction costs, "It just wasn't feasible; if we are looking at cost benefit analysis, it was just too expensive for the small area" (O2). This viability issue is discussed further in Section 5.2.

5. Discussion

The Discussion is structured to directly answer RQ1, 'What challenges impede the international blue carbon agenda from being realised at national and subnational levels?' (Section 5.1), and RQ2, 'What do these challenges mean for the practicality and viability of blue carbon credit trade and NDC integration?' (Section 5.2). Throughout we note contributions to MLG theory, connect with broader literature, and point to future research avenues.

5.1. An international agenda impeded at national and subnational levels

Our findings reveal that motivations for pursuing the blue carbon agenda, through attempted promotion, facilitation, and delivery of outputs and outcomes, vary between different governance levels. At the international level motivation to promote, facilitate, and deliver outputs and outcomes on blue carbon is strong – driven by overarching climate, biodiversity, and ocean policy, international funding preferences, technocratic methodologies, and, we would argue, the self-preservation of funded work programmes and personnel. Yet, due to a combination of limited fine resolution data and transparency, weak communication, and the limited agency of international actors at lower levels, this motivation diminishes at the national level. Here, overlapping bureaucracy, competing interests, incapacities, and a lack of deep knowledge create confusion and inertia on BCE management and blue carbon. This inertia is compounded by complex land and resource ownership rights at the subnational level, which also hinders attempts from international actors to establish blue carbon projects in specific localities.

The slow understanding and adoption of the blue carbon concept among national and subnational governance levels in Fiji (Section 4.2) corroborates the phenomenon of the 'global disconnect' of SIDS (Lynch and Szorenyi, 2005). While coined in 2009, the blue carbon term only became known to most of the non-foreign interview respondents in Fiji two or three years ago. Scholarly work on this 'disconnect' arose from analyses of Fiji's socio-economic disposition, a consequence of its remote location in the Pacific (Fiji, 2017; Lynch and Szorenyi, 2005), but is exacerbated in the case of blue carbon by the technocratic methodologies, data siloing, and fickle funding priorities emanating from the

international level, as discussed in Section 4.1. Indeed, "much policy development in SIDS is donor-funded and, therefore, donor-designed and influenced" (Filho et al., 2024).

Attempts to improve the institutional framework for blue carbon in Fiji through changing or creating blue carbon related policies and plans, have been underwhelming, with examples being the yet-to-be ratified Mangrove Management Plan 2013, and the ongoing lack of recognition for mangroves in Fiji's REDD+ policy. Importantly though, indecision on these matters is occurring due to impediments conveyed throughout Section 4 such as overlapping bureaucracy and competing interests among national ministries – and international actors can do little to mediate this. Although such policy efforts have gained greater success elsewhere (Song et al., 2021; Wedding et al., 2021), the institutional framework for blue carbon in Fiji remains underdeveloped stemming from a lack of communication, coordination, and capacity both between and within the multiple levels of governance.

Overlapping bureaucracy around BCEs at the national level has been discussed in blue carbon scholarship before (Friess et al., 2016; Ayostina et al., 2022) but the importance of this issue requires underscoring amid recent advancements in the governance literature (e.g., Haftel and Lenz, 2022). In particular, we reveal that overlapping bureaucracy caused by the high ambiguity in roles, responsibilities, and targets around BCE management means it becomes challenging to hold specific actors *accountable* for inaction (Haftel and Lenz, 2022). This can enable government agencies to evade responsibilities and/or blame other government agencies (or non-government actors) for blue carbon efforts that are perceived as slow, duplicative, or incompetent (sensu Haftel and Lenz, 2022) – as demonstrated throughout Section 4. The updated but unratified MMP for example, fails to provide clear remits for each government agency. This creates a 'chicken and egg' situation where ambiguity on the responsibilities of government agencies prevents the ratification of formal institutions such as the MMP, while the absence of formal institutions prevents an end to ambiguity on responsibilities. Meyer et al. (2009) consider institutional arrangements to be strong if the roles of actors align well with regulations. Our findings corroborate the reverse of this, demonstrating that the lack of a clear institutional framework can hinder bureaucratic transparency and effectiveness – through ambiguities around land and resource tenure, and salami-sliced laws on BCEs as evident in Table 2.

The subnational level adds further complexity, with international and national actors requiring the engagement of local and Indigenous communities in the BCE restoration and conservation efforts that underpin blue carbon projects. As Contreras and Thomas (2019) assert, "The voices and agency of local communities, and the application of local knowledge in blue carbon projects, remain limited". Notably, Section 4.2 reveals opposing perceptions between national and subnational actors regarding the extent of this. The former claim they consult with communities to ensure they consider BCE projects to be suitable and appropriate, thus securing their agreement for it to occur. Yet, the latter report limited interaction with the national once this is granted. This resonates with recent assertions from Carlson (2024), who claims many blue carbon projects are only *ostensibly* community or Indigenous-led, that Indigenous people can only access a fraction of the blue carbon funding available to international organisations, and that there is a risk of 'indigenous erasure' by international blue carbon practitioners.

Thus, we forewarn that BCEs in Fiji and other SIDS may be better conserved and restored through more locally conducive and desired approaches, rather than by attempting to adhere to a blue carbon agenda being promoted from the top-down. For example, the duality of land ownership means the legally recognised beneficiaries of potential carbon credit revenue remain in question, while financial benefit sharing is problematised by complex Indigenous community structures (Section 4.2.1). Other approaches to BCE management may not only be more cost-effective but also more culturally sensitive and contextually relevant as other research has demonstrated (Quevedo et al., 2024). Moreover, BCEs are critical to climate change adaptation, not only mitigation. Yet, Mitra and Sanghi (2023) claim the interests of SIDS have been "inverted" by policy discourse that places focus on mitigation as opposed to adaptation, with the latter often more desired by coastal communities (sensu Narayan et al., 2020). Moving forward, vigilance is required to ensure possible subnational adaptation preferences for BCE management are not obfuscated by international actors pushing the blue carbon agenda, and this could be an area for future study.

Relatedly, the incapacities, including but not limited to workforce, skills training, and demanding time schedules, as discussed by 15 respondents in the results, corroborate evidence from other SIDS (Delgado-Gallego et al., 2020; Rustomjee, 2016; Veitayaki et al., 2017). In such cases, it is normal for international organisations and international NGOs to assist the Government of Fiji in areas where there is a capacity deficit, advising governments on policy matters and filling capacity gaps (Section 2.2). Yet, our findings push back against this normative occurrence. We recommend that national level actors – those within Fiji's ministries – should be fully informed such that they are able to make unswayed decisions to promote – or equally, suppress – blue carbon project efforts related to credits, NDCs, or otherwise. Our results infer that dependence on international expertise is not always perceived as useful and that it could be prudent to increasingly look inwards to upskilling local experts (sensu Grydehøj and Kelman, 2020). This contradicts the oft-cited recommendations of a plethora of blue carbon (Delgado-Gallego et al., 2020; Rustomjee, 2016) and broader environmental governance commentators (De Donà, 2021; Milman et al., 2020) – for greater technical expertise and institutional capacity to be provided externally by international experts. Aligning Section 4.1 and 4.2, we assert that international actors are needed – but specifically to adequately train and empower Fijian actors such that they can steer blue carbon and broader BCE decision-making and management in their own way – rather than forever relying on, and delegating to, international organisations and consultants.

5.2. Implications for blue carbon credits and NDCs

Numerous papers argue that a lack of (sub)national BCE data – be it geospatial, biophysical, or biogeochemical – is hindering the incorporation of BCEs into climate change mitigation policies related to credits and NDCs (Arkema et al., 2023; Bertram et al., 2021; Dencer-Brown et al., 2022; Friess, 2023; Macreadie et al., 2019; Taillardat et al., 2018). Our findings do corroborate this fine resolution data deficiency issue, and we acknowledge the need to ensure blue carbon stocks and sequestration rates are not overestimated or underestimated (Lovelock et al., 2017; Taillardat et al., 2020). We also acknowledge that data deficiencies do underpin some of the MLG challenges presented in Section 4 (Wedding et al., 2021). However, in contributing empirical research from Fiji, as a representative example of many SIDS, the results of this study help explain why many SIDS may struggle to incorporate blue carbon into climate change mitigation policies such as credits and NDCs – irrespective of how much BCE data is collected. The majority of the challenges to credit trade and NDC incorporation are unlikely to be overcome by improving data availability and quality alone and stem from weaknesses between and within governance levels.

Our results show that a primary reason to forgo adding BCEs into NDCs is that it can prevent future trade of those credits through the VCM, which becomes a potential opportunity cost to the prospective recipients of credit revenues. Since Fiji is still seeking to identify the economic benefits that credit trade could provide, this complexity is creating inertia around incorporating blue carbon into its NDC. These findings (Section 4.2) go beyond prior literature that describes this potential situation, by evidencing it as a real-world conundrum facing signatories of the UNFCCC and Paris Agreement. Furthermore, any carbon credits traded as ITMOs under Article 6 must be additional to the NDC target, which creates further complexity when subnational drivers of BCE loss are low and/or highly localised (Section 4.2.3), meaning the number of credits that could go towards NDCs (and subsequently,

ITMOs) will already be in short supply.

This raises the question as to whether trading blue carbon credits voluntarily through the VCM, and integrating blue carbon into the compliance mechanisms of the Paris Agreement (NDCs and ITMOs), are *equally* effective and appropriate avenues for BCEs to mitigate climate change. Credits traded on the VCM come with financial benefits to those that have the rights to land and/or BCEs, and/or blue carbon within those BCEs, depending on the tenure arrangements in place. Such crediting projects would likely operate at the subnational level and could potentially bypass state intervention if traded through the VCM. Conversely, NDCs require rigorous national oversight and do not in and of themselves provide direct financial benefits to those with tenure rights at the subnational level. Yet, if blue carbon is included in the NDC, we suggest it could be conceivable for national governments to create compensation or reward programs for local actors and subnational governments that restore, conserve, and sustainably manage BCEs. This could be an area for future research around NDCs and those on the ground who are responsible for the daily actions that help ensure pledged contributions are realised.

As our qualitative data testify, inertia also stems from quantitative BCE data that *is* available. For example, Cameron et al. (2021b) performed a carbon stock assessment at multiple mangrove sites in Fiji and identified high carbon stocks. Nevertheless, it was subsequently noted that the viability of any blue carbon project would be site-specific, and generally low, because of the limited extent and rate of loss (Cameron et al., 2021a) – resonating with our findings in Section 4.2.3. Based on data within these two studies, we calculate that Fiji loses 71.5 ha of mangroves per year (65,243 ha mangroves with a loss rate of 0.11%). Incidentally, the *smallest* of the 70 mangrove blue carbon projects identified by Perera et al. (2024) is Mikoko Pamoja in Kenya, at 125 ha, with most projects being one or two orders of magnitude larger. Given the 71.5 ha figure for Fiji is nationwide, it is difficult to see how any blue carbon project could be financially viable amid the high costs of project development, verification, and management (Duncan et al., 2022; Mack et al., 2022).

Average mangrove carbon stocks in Fiji are quite high at 481.6 tCO_2e ha^{-1} – noting that soil carbon was measured to 1.5 m depth and comprises 64.6% of this total stock (Cameron et al., 2021b). However, it would be incorrect to assume that this means 34,434 tCO_2e ha^{-1} yr^{-1} (481.6 tCO_2e ha^{-1} multiplied by 71.5 ha) emissions reductions could in theory be creditable or includable in Fiji's NDC. Rather, emissions forecasting will be necessary to determine how much carbon is released following specific mangrove disturbances (see Richards et al., 2020; Thompson et al., 2014). This would likely render this amount far smaller, since 77% of the Fiji's mangrove loss is caused by typhoon damage (Cameron et al., 2021b) which is unlikely to lead to significant soil carbon efflux (as a result of oxygen reaching deep anaerobic mangrove soils) given the shallow depth of disturbance (Ouyang et al., 2021) – compared to, for example, during the deep excavation of mangrove sediments to establish aquaculture ponds (Santos-Andrade et al., 2021). Moreover, high blue carbon credit prices will be required to ensure financial viability of projects in countries with low rates of loss, low rates of afforestation and reforestation, and limited scalability (Vanderklift et al., 2019) – namely, Fiji and many other SIDS. Incidentally, blue carbon credit prices averaged $8.33 in 2023 (Forest Trends' Ecosystem Marketplace, 2024) but increased to $29.72 in 2024 (Forest Trends' Ecosystem Marketplace, 2025) - which offers optimism for proponents should this price remain stable, or increase futher in the coming years.

6. Conclusion

We evaluated how multi-level governance influences blue carbon credit trade and NDC integration – revealing an array of challenges that manifest at one governance level, but which create or exacerbate further challenges at other levels. Our findings contribute to MLG theory by demonstrating why the blue carbon agenda, emanating from the international level, may not be implemented administratively or in practice, at national and subnational levels. The MLG framing has provided a deeper analytical understanding of the interactions between blue carbon governance levels, especially given our dedicated focus on credits and NDCs. Ultimately, we advocate renewed focus on national-subnational interactions (Atchison et al., 2024; Contreras and Thomas, 2019; Quevedo et al., 2021), alongside critical introspection on national-international interactions (Song et al., 2021). Our findings push back against rhetoric on the role that blue carbon can play in NDCs and carbon crediting schemes, by raising questions on the applicability of this in practice, particularly for SIDS. We find that a state of blue carbon inertia has existed in Fiji for over a decade, inertia that those promoting blue carbon at the international level are struggling to overcome – and that some national and subnational actors seem ambivalent on them overcoming.

Notably, some of the challenges creating this inertia have been overcome in other countries. For example, in Australia, tenure-related barriers have been partially addressed through contractual agreements that define carbon ownership independently of land title (Australian Government Clean Energy Regulator, 2022). Meanwhile, in Kenya and Mozambique, some blue carbon projects agree to share a proportion of carbon credit revenue with local communities regardless of formal tenure and or carbon ownership agreements (Perera et al., 2024). Furthermore, local stakeholders have been included in the highest levels of blue carbon project implementation in Japan (Powers et al., 2025), while in the Philippines greater stakeholder collaboration has improved awareness and support between national and subnational governance levels (Duncan et al., 2022; Quevedo et al., 2024). Finally, blue carbon project developers have attempted to diversify BCE-related income sources for communities, to protect against carbon credit price fluctuations and increase project resilience (Powers et al., 2025) – with methods available to determine multi-stakeholder preferences for BCE management beyond blue carbon (Thompson and Friess, 2019). These approaches support our MLG framing since they clearly require coordination across governance levels.

Since our social science study aligns with recent biophysical science studies (Cameron et al., 2021a) that question potential of blue carbon projects in Fiji – and likely other SIDS, it is worth considering other avenues through which to finance BCE conservation and restoration beyond trading carbon credits on the VCM. One increasingly adopted approach is financing blue carbon initiatives through Results-Based Payments (RBPs). RBP financial support is provided only after measurable outcomes, such as verified blue carbon removals or emissions reductions, are achieved. Payments could be provided by traditional conservation donors – such as The World Bank's payment to Indonesia in 2022 – but can also be made by national government to a subnational government (IOJI, 2023). Thus, RBPs can occur across international, national, and subnational levels, which is relevant in the context of MLG. Crucially, RBPs do not require the transfer of carbon ownership, and are counted towards a country's NDC. Indonesia's RBP was operationalised through REDD+ and included BCEs because mangroves have been explicitly recognised as part of Indonesia's Forest Reference Emission Level (FREL) and other international agreements such as its REDD+ RBP with Norway (IOJI, 2023). Fiji's inclusion of BCEs in its own REDD+ policy may create possibilities for RBPs in the future.

Blue bonds offer another potential option (Thompson, 2022a). These could be issued by individual or groups of sovereign states, municipalities, or conservation organisations, with investment provided by conventional investors. These investors receive interest payments (coupons) plus repayment of their original investment in full (principal) after a pre-agreed timeframe has elapsed (the maturity date). Fiji has issued a blue bond, although it is more focussed on marine protected area (MPA) management, green shipping, and aquaculture, with no clear indication that funds will go towards BCE restoration and conservation (Thompson, 2022a). Nevertheless, questions would remain about how revenue

would be generated from such a bond (necessary for the issuer to pay investors their coupons and principal) – with only tourism user fees for mangrove ecotourism, or the sale of blue carbon credits, likely to generate these, but by no means guaranteed (e.g., Thompson, 2022b). Other avenues include the use of Corporate Social Responsibility (CSR) funds to restore BCEs with corporations then reporting carbon removals in sustainability reports and/or using credits for offsetting to achieve corporate goals around net zero (Friess et al., 2022). Nevertheless, RBPs, bonds, and CSR will still require effective multi-level governance, and will still be driven by the international blue carbon agenda.

Arguably the biggest beneficiaries to efforts to drive the blue carbon agenda in Fiji, SIDS, and elsewhere, are the array of international actors, many of whom are financially and institutionally locked-in to attempting to promote, facilitate, and deliver blue carbon projects in the countries in which they operate. Our eight interviewees from 'organisations' (O1-O8) included non-Fiji citizens that were open about this situation. Nevertheless, finance for blue carbon activities remains high (Friess et al., 2022), and personnel remain tasked with attempting to achieve blue carbon outputs and outcomes. Better understanding how proof-of-concept and track record were established in the countries with operational blue carbon projects, as well as interrogating their ethics and justice, would be a start (sensu Atchison et al., 2024). This necessitates further social science research at all governance levels. Indeed, the *physical* science on blue carbon may well be "clear" (Friess et al., 2022), but the *social* science is anything but. Heightened attention on blue carbon credits and NDCs – which are inherently tied to policies that transcend governance levels – underscores this necessity.

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CRediT authorship contribution statement

Megha K. Purushotham: Writing – review & editing, Writing – original draft, Visualization, Validation, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Benjamin S. Thompson:** Writing – original draft, Visualization, Supervision, Investigation, Funding acquisition, Conceptualization.

Declaration of competing interest

The authors have nothing to declare.

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Data availability

The data that has been used is confidential.

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