Explaining ‘carbon’ in community sequestration projects: a key element in the creation of local carbon knowledges

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Abstract

The formation of local carbon knowledge is central to the meaningful participation of communities in the land-based carbon projects which have become widespread in pursuit of global emissions reductions. Through a qualitative analysis of interviews with community sensitization practitioners, this paper considers how concepts of carbon are communicated to project communities. We find that fieldworkers use people’s own experiences to make intangible carbon visible, but rely on scientific concepts to explain the transfer of carbon between states. However, interviews suggest that project communities’ knowledge and understanding of carbon is partial. This highlights the challenges of meeting the safeguarding principles of respect for local knowledge and informed consent in carbon projects. We conclude that greater attention needs to be given by planners to the role of communication in carbon projects, including the potential to draw on indigenous knowledges to advance local understanding.

Keywords: Carbon Trading; Communication; Knowledge Sharing; Participation; REDD

Word count: 8092

Introduction

Community-based carbon projects, whereby land users receive payments for practices that increase or maintain the levels of carbon stored in soil or vegetation, have become an important mechanism for emission reductions within the Kyoto protocol of the UN Framework Convention on Climate Change (UNFCCC). Within such projects, payments to communities or individuals for adopting, or desisting from, specific management practices are linked to verified emission reductions (carbon credits) which can be traded on voluntary carbon markets (VCMs) or used to meet reporting requirements within Reducing Emissions from Deforestation and Forest Degradation (REDD+) projects. These payments have become important elements in rural

development and conservation projects both in agriculture and forestry, and their inclusion is often framed as a 'triple win' – for climate mitigation, biodiversity conservation and rural development (Turnhout et al., 2017).

Whilst initially welcomed by some as a radical tool for conservation, particularly with regard to forests, the potential for appropriation of forest resources and loss of rights by indigenous communities was quickly recognized (eg. Lawlor & Huberman, 2009). The REDD+ programme in particular faced vocal opposition from indigenous peoples and forest communities who saw a continuation of historical attempts to control forest resources and threats to their rights and identities (Suiseeya 2017). As a consequence, social safeguarding became an explicit element in the standards and procedures of most agencies involved in the generation of carbon credits (McDermott, Coad, Helfgott, & Schroeder, 2012). In particular, safeguarding measures were agreed at UNFCCC COP 16 in Cancun that require REDD+ activities to be implemented with the full and effective participation of relevant stakeholders, in particular indigenous peoples and local communities, and with respect for their knowledge and rights (UN-REDD, 2017).

Over the past decade there has been considerable scholarship concerning the challenges of achieving justice or equity in carbon projects (McDermott, Mahanty & Schreckenberg 2013; Mathur, Afionis, Paavola, Dougill & Stringer 2014; Pasgaard, Sun, Müller & Mertz, 2016). Nonetheless, despite the widely reported problem of limited local understanding of carbon projects together with numerous critiques of the marginalization of local knowledge systems, there has been limited investigation of the processes of knowledge creation around carbon in the global south (Twyman, Smith, & Arnall, 2015). This lies in contrast to the extensive literature on the creation of carbon discourse at the international policy level (Bumpus 2011, Nel 2015, Stephan, 2013).

In this study we focus on the ways in which ideas of carbon formulated at the international science policy level are articulated on the ground. Whilst recognizing that this is but one constituent of local knowledge formation it is nonetheless a key element with implications for safeguarding principles that require both the full and effective participation of stakeholders and respect for local or indigenous knowledge.

This paper begins with a review of the challenges and experiences of actors in carbon credit projects around the practices of communicating carbon. We consider the debates around the integration of local or indigenous knowledge in climate change and the possibility of 'knowledge diversity' in carbon communication. The potential exclusion of 'other' ways of knowing through carbon projects is related to frameworks of environmental justice through the concept of 'recognition'. We then present an analysis of interviews with community facilitators to explore how carbon is explained to local communities in carbon credit projects. This qualitative analysis illuminates some the techniques by which carbon is created on the ground and highlights challenges of meeting safeguarding principles of respect for local knowledge and informed consent in carbon projects.

Communicating carbon

Despite commitments to Free Prior and Informed Consent (FPIC) and 'awareness raising' activities in REDD+, and a longstanding recognition of the importance of local participation in conservation and rural development practice (Blom, Sunderland & Murdiyarso, 2010), numerous reports and studies imply that understanding among communities in carbon project areas is often (or even usually) limited. In a training manual for reaching consent in carbon initiatives in South East Asia, the authors observe that 'although REDD+ project proponents across the region believe they have carried out thorough awareness raising, the population usually shows little or no

comprehension of the content' (Edwards, Triraganon, Silori, & Stephenson (2012 p. 76). Similar examples can be found throughout the literature which attest to the partial knowledge of carbon and payment mechanisms held by many project participants. In the case of a carbon farming project in Kenya, Atela (2012) notes that '[m]any farmers have no idea that the new project is being implemented under 'a triple win' climate smart agriculture banner' and 'how these activities translate into carbon credits is not clear to them' (p. 21). Stringer et al. (2012) report comments by a Malawian project worker that 'local communities don't understand carbon storage' (p. 164). In a community carbon project in Mozambique interviewees were not able to explain the 'science' behind carbon credits but did assert that carbon was being produced locally and sold elsewhere (Dyer et al., 2014). Surveys of communities in REDD+ project areas report limited knowledge of the details of REDD+ beyond 'forest protection' even where project awareness is high (Krause, Collen & Nicholas 2013; Cromberg, Duchelle & Rocha 2014; Samndong 2018). Poor grasp of REDD+ by project communities is inevitable where consultation has been cursory or poorly executed (eg. Leggett and Lovell, 2012) but even where recommended FPIC procedures are followed, the opportunities for developing shared understanding are often limited (Mc Elwee, 2017).

In the context of carbon projects the challenges of FPIC are numerous. Some of these lie with the difficulty of organizing consultation in remote and dispersed rural communities, ensuring wide participation and arriving at 'community' consent in the context of unequal power relations and political representation. A substantial and growing literature on the impacts of REDD+ attests to these problems (Bayrak, & Marafa, 2016). The technical complexity of carbon projects has also been linked low levels of participation: the complex management, reporting and monitoring requirements favor a high level of external expertise (Howard, Tallontire, Stringer, &

Marchant, 2015) and may even be used as justification for excluding local communities (Leach & Scoones, 2015, Mbeche 2017). Community facilitators are tasked with explaining chemical processes and financial mechanisms in relation to an intangible substance: “The topics are uncertain and complex; even university educated staff found it difficult to conceptualise.” (Week, Diprose, & Jessup 2014). Nonetheless, communicating this material is central to sensitization activities and facilitators are held responsible for ensuring understanding is achieved (UNREDD, 2013, p. 46).

UN-REDD guidance and manuals written specifically for project developers in the VCM (eg. Richards and Panfil, 2010) give clear instructions on best practice for the participatory planning and design stages of projects but little advice about translating ideas of carbon into local settings. Similarly, training guides on FPIC focus on the meanings and principles of consent and tools for implementing consent processes (eg. Edwards et al. 2012), but do not address the challenges of achieving informed consent with regard to understanding carbon accounting mechanisms.

The problem of effective communication does not go unrecognized: a Communicating Carbon workshop facilitated by CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) in 2011, encouraged facilitators to share experiences with the goal of developing best practice in carbon communication. The policy brief that emerged makes some suggestions to improve communication (Table 1.) but also highlighted a lack of appropriate information materials based on local conditions and in local languages (World Agroforestry Centre, 2011).

Civil society organizations (CSOs) have since been instrumental in creating resources for communities to support their engagement with climate finance or associated projects. One guide to these materials lists 15 training manuals and modules produced by indigenous people’s organizations and conservation groups around the

world (World Wide Fund for Nature [WWF], 2013). These manuals typically provide substantial and detailed content for training programs with the explicit aim of communicating 'complex scientific and economic concepts of climate change and REDD+ to an audience that includes people with limited formal education (if any), and low literacy' (Henderson, Nelson, and Kiessling (2012, p. 7). These carefully conceived training scenarios are often at odds with the short time frames available for project workers to conduct their sessions (eg. Nguyen, Luong, Nguyen & K'Tip 2010).

The challenge of communicating carbon credits across knowledge systems is explicitly recognized by the authors of a number of these manuals (e.g. AIPP, 2012; Henderson et al., 2012; Stone, & León, 2010). However, a review of these materials reveals that efforts to make this information accessible, such as through cartoons and practical activities, still employ concepts (the earth as a ball in space, states of matter and invisible 'gas') wholly within the modern scientific tradition (Figure 1). There is no acknowledgement of indigenous cosmology or knowledge.

An absence of references to indigenous or local understandings stands in contrast to widespread acceptance of the relevance of local technical or ecological knowledge for development since the 1990s (Briggs 2005) whether as a starting point for technology development in agriculture, in monitoring biodiversity, or understanding climate change impacts (Klenk, Fiume, Meehan & Gibbes 2017). Nonetheless, arguments persist around the possibility or desirability of the integration of knowledge systems, reflecting concerns around power relations and the extraction of knowledge, the social embeddedness of knowledge, and the incommensurability of knowledge systems (see reviews by Bohensky & Maru 2011 and Meiser 2017).

In the case of carbon projects the potential for the integration of local knowledge is advocated mainly in relation to monitoring (Gupta, Lövbrand, Turnhout & Vijge

2012; Larrazábal, McCall, Mwampamba & Skutsch 2012). In contrast, suggestions of incorporation of local knowledge in carbon communication are sparse. In a rare example, Roy, Silori, Poudyal, & Paudel (2014) imply that local knowledge has been incorporated into project explanations and sensitization activities in Nepal: 'the integration of local wisdom with scientific knowledge brings common understanding and helps in simplifying the concept of REDD+, thus enhancing the understanding of grassroots stakeholders.' (p. 4).

Engagement with indigenous knowledges in relation to climate change and carbon cycling, must inevitably grapple with the intangible, such as local concepts of weather, atmosphere or gases. Twyman et al. 2015 suggest this may necessitate a "different form of dialect between knowledges" but what form this could take is not clear. Green (2008) argues for recognising the value of indigenous or local representations of complex realities for their potential to advance understanding, rather than their capacity to express a strict realism. This call for 'knowledge diversity' is useful when thinking about climate change communication in carbon projects in order to find "a way of engaging with difference which does not require the effacement of belief" (Green, 2008). Here we are not presenting a case for 'co-production' of carbon knowledge (with all its attendant challenges (Goldman, Turner & Daly 2018) but rather the recognition of the potential of appropriate local models to advance understanding.

Through a critical political ecology lens the extension of carbon knowledge in the context of REDD+ or other VCM projects represents a process of privileging a neoliberal, western perspectives to the exclusion of other ways of knowing and being. Within an environmental justice framing this can be conceived as 'malrecognition'; that is "instances in which forms of formal and discursive power discriminate against difference and suppress the right to alternative ways of thinking and doing" Martin,

2017:17). From this perspective the importance of communication is raised beyond the target of achieving ‘effective participation’ and is implicated in the rights of peoples to self determination. The need to incorporate recognition within environmental justice frameworks has been articulated in respect of conservation practice more broadly (Martin et al. 2016; Martin, McGuire & Sullivan 2013). In the context of REDD+ the potential for engagement practices (including knowledge delivery) to alter perceptions and re-order cultural and socio-economic relationships to forests and land means that the risk of malrecognition is acute (Boer 2019). In addition to altering peoples relationships to ‘nature’ project communications can also be a source of new fears. A number of studies have reported how REDD+ sensitization has created anxieties in local people: ‘If [they] come here and destroy our forest and our resources and steal our air I'm really worried. If they eat up our air, our children are going to die - what will they breathe?’ (Leggett & Lovell, 2012, p. 125) and ‘The extensionists told us that, if we planted trees, they would grab onto air called carbon, and that we could sell it. All I could think was, ‘I wonder how they will harvest this carbon. Do you think they will come with buckets to take it away?’ I was shaking when I left the meeting.’ (Shapiro-Garza, 2013, p. 11). There have also been cases where new knowledge provided by facilitators is reassuring. Sturgeon, Legrange, Leonard-Fabrice, & Crawhall (2011) report that in their training workshop in Gabon, Baka elders thanked them for explaining the causes of climate change which they had felt was their punishment for angering forest spirits. This last example suggests that new carbon knowledges can be accommodated alongside existing ontologies.

To summarize, despite extensive scholarship on the implementation of carbon projects; the integration of indigenous and scientific knowledge in climate change knowledge and adaptation; and the role of discourse in creating new subjectivities in

relations to climate governance, we know relatively little about how new knowledges of carbon are being constructed on the ground. The current research seeks to begin to close this gap by exploring how facilitators go about explaining carbon to communities in project areas. Our aim in this qualitative, exploratory study is to examine facilitators' accounts across a diverse range of projects in order to describe the key themes which emerge and identify some issues that would benefit from further investigation.

Method

To address the question 'how are carbon concepts explained to project communities' qualitative interviews were conducted with 10 field staff from carbon projects in 8 countries (Ghana, Tanzania, Burkina Faso, Kenya, Brazil, Columbia, Guatemala and Indonesia). Respondents had worked on a range of carbon initiatives in forest and rangeland environments. All respondents were working on different projects.

Participants were recruited by the authors or research assistants in each country through their own professional networks. The key criterion for inclusion was that the respondent had responsibilities for facilitating community meetings to explain carbon projects. Interviews were semi-structured and followed a standard interview protocol of 12 open questions (Appendix 1) but allowing for interviewers to ask follow-up or clarifying questions.

The interviews began by collecting background information on the project before proceeding to ask the respondent to explain how they introduce the idea of carbon to a community; whether and how they explain the concept of offsetting; what language they use; and whether they employ visual aids, local concepts or metaphors. Respondents were then asked about people's responses to their communications: what questions arise; who asks them; and whether local people draw on their own experience to make sense of carbon. It was emphasized to respondents that they were not being

judged or tested in regard to their knowledge or understanding of carbon concepts, and that it was our goal to record the different ways in which carbon concepts are expressed, translated and shared. Questions were phrased to encourage an open response, for example: ‘When you introduce the idea of carbon to a community how do you begin?’ or ‘Can you explain everything to me as if I were a project beneficiary?’

Each research assistant was responsible for transcribing their interviews. Where necessary the authors translated final transcripts into English from French or Spanish Transcripts were coded and analyzed by the authors together using NVivo®. A narrative approach was adopted in the sense that transcripts were approached as topical stories about particular events or encounters (Chase, 2005; Riessman, 2008). Hence we do not treat these accounts uncritically as factual renditions of practice but recognize them as descriptions constructed by the respondent.

The coding scheme was developed as follows: Both authors first reviewed and coded each transcript independently. This was done through open coding where each transcript was reviewed line by line to identify themes within the text. These 30 initial codes (recorded as nodes in NVivo) were generated freely and ranged from specific (for example references to oxygen) to more general such as any text related to explanation of carbon. Subsequent discussion between the authors identified and eliminated duplicate and very narrow codes and defined code meanings. Twenty-two codes were agreed and all ten transcripts were recoded by the authors together using this final scheme. Reliability of coding was achieved by the two coders discussing and agreeing a coding scheme, defining codes and recoding the transcripts together with the new scheme (this was possible because of the small sample size). The codes are therefore considered reliable and stable.

The 22 codes were subsequently grouped into 6 primary themes (Appendix 2). Five of these are related to the overarching theme of 'explanation' which is central to our research question and these data form the basis of our analysis (the sixth primary theme related to concerns about projects and this is not discussed here). Following the grouping of the codes into 5 themes of explanation, each transcript was revisited to review whether and how these features were presented in the interview narratives.

Results

We identified five primary themes within respondents' accounts relating to how they explain carbon: Difficulty of explanation; materializing carbon; dangers of carbon; capturing carbon; and payments for carbon. All five themes were present in seven out of the ten interviews. The remaining contained at least three of the core themes. These will be considered in turn below followed by a discussion of the findings on communication methods.

Difficulty of explanation

In the course of describing their own practices with regard to sensitizing communities about carbon projects, respondents readily acknowledge the difficulties they face. The intangibility of carbon and the invisibility (to participants) of carbon markets emerged as key themes.

> The most difficult [to explain] was carbon measurement, and carbon markets. Questions like 'how can we measure carbon while carbon is not visible?' and 'Where can we find the carbon market?' It was a real debate my friend, I think you know how intellectual people do debate, you get to sweat. *Tanzania 1*

> [Laughing]. You know when you try to explain the chemical composition of these things – carbon dioxide, oxygen etc. are abstract and so very difficult for the local people to understand. *Ghana 1*

Some of the finer compliance requirements of carbon projects can also present a challenge for facilitators. For example, carbon projects must demonstrate additionally, that is without their activities carbon emissions would be higher. For this reason, carbon in forests that is already protected, and therefore not at risk, is not eligible for payments. A rationale that is not always clear to participants:

> The most complicated is to explain and justify that threatened areas with high deforestation are suitable or eligible for REDD+ unlike pristine forests where no deforestation occurs – those forests are not attractive for REDD. *Columbia*

Materializing carbon

Making carbon visible to their audience is a common strategy employed by facilitators to overcome the challenge of explaining intangible carbon compounds. Facilitators describe how they 'materialize' carbon by utilizing communities' experience of black carbon as soot: a tangible substance that all rural dwellers have direct experience of on cooking pots, in smoke and from burnt vegetation.

> [I]n our communities they have different practices when they are going to prepare their land. Sometimes they clear and gather the material on the farm and burn…This practice … produces heavy black smoke which eventually rises into the atmosphere. So what we often do is try to get their own understanding of where they think the smoke goes. So we try to liken the smoke to carbon which goes into the atmosphere and destroys it. *Ghana 2*

The darkness of carbon is also used to make visible its presence in the soil:

> I show the group two types of soil – light soil that lacks organic matter and darker more organic rich soil, usually from directly under a plant. I point out that the darker soil contains more dead plants and roots which are made mostly of carbon. *Kenya*

Dangers of carbon

Once carbon has been identified in a form recognizable to their audience, facilitators then need to explain the 'problem' or danger of carbon. To do this carbon is often first characterized as toxic to humans. For example:

> We ask if they noticed the smoke from mopeds and cars when they are running. They answer in the affirmative. Then we ask if you can breathe this smoke profusely for a long time without choking? They recognize that you cannot. *Burkina Faso*

Following from the dangers of carbon to human health, facilitators introduce the danger carbon poses to the atmosphere by linking imagery of carbon released into the atmosphere through burning to the phenomenon of global warming (the impacts of this are often discussed in relation to people's experience of changing climate):

> [t]he 'greenhouse' is compared to the traditional way of life of families in the communities where the kitchen is in the same area as the accommodation and dining, creating a greenhouse effect inside the house… the smoke from stoves is pollution and the [roof] is the ozone layer. *Guatemala*

> I show a picture of factory and smoke and talk about greenhouse gases that make the earth warmer and change the climate. In Kenya, the climate is growing drier, or at least it has over the past 20 years, so the people can relate to changing climate. Then I make the point that putting more carbon in the soil, or making it darker, takes warming gases from the atmosphere and locks them up in the soil. *Kenya*

Carbon is characterized both as a 'warming gas', directly or indirectly leading to climate change, and also by some as a destroyer of the ozone layer:

> The effect we see is that these gases destroy the elements that protect us against the sun's heat. *Burkina Faso*

> Take an example of this white paper [respondent demonstrates to the interviewer]. This white paper is like our sky that is between us -the earth- and the sun. Once I light up this matchbox, the heavy smoke that turns this paper to black and finally leading the paper to develop holes is the example of how carbon emission destroys the ozone layer to the point of making people in this community to get direct heat from the sun. This direct heat leads to climatic changes that we do experience. These are the examples I use to demonstrate to the local community so that they can understand us better. *Tanzania 2*

Capturing carbon

Regardless of how the danger of released carbon is described (as toxic pollutant, warming agent or destroyer of our protection from the sun) facilitators explain that trees or soil can absorb this carbon and mitigate the effects. This requires facilitators to switch from narratives of 'bad' carbon, to 'good' carbon, usually by evoking the idea of balance:

> [T]he idea is to explain the cycles and the importance of balance, … [we] show the pollution -it is easier to use the black smoke as proof of this- and how, what could be toxic for us, plants - and especially forests - can take it and use it as 'food' and transform it into branches, leaves, roots, soil, etc. *Colombia*

> We also explain that although it is black and causes a lot of harm to our environment, its absence can be catastrophic because that is what the plants use in making their food so there must be a balance of this substance in the atmosphere. *Ghana 1*

The role of trees and forests in absorbing carbon, and the importance preserving them to prevent its release, was a dominant theme:

> So we take this opportunity to discuss this poorly understood role of trees. Trees absorb this gas and release oxygen for us to breathe safely. …We explain to them that this gas and others more toxic are produced by larger machines around the world. It is the world's trees, including those you protect and maintain in your

> fields and conservation areas, that have the task to capture this gas to provide a balance to our planet. *Burkina Faso*

> We try to link this to the communities by creating an understanding that the trees that are there are able to absorb some of the smoke or the warm air that is released into the atmosphere. We make them understand that by doing this [project], they are deliberately reducing the amount of the warm air released through burning that gets into the atmosphere. *Ghana 2*

> The explanation varies but in general it goes to how much pollution can be avoided to get into the air by conserving and protecting a forest. *Colombia*

An explanation of the process of carbon absorption (photosynthesis) was tackled by some, invoking analogies with breathing:

> [We] explain that as human beings when you sit under a tree, the tree breaths in the warm air we breathe out and breaths out the cool air that we breath in so … if you have many trees around, they give us more air for us to be able to breathe in, so those are the kind of explanation we do. Sometimes we use diagrams to show this exchange of gases between trees and human beings for them to appreciate the role of trees in sustain life on the planet. *Ghana 2*

This can lead to the inference that without trees there will be no oxygen, an interpretation that is sometimes conveyed to communities:

> Look! For example we have trees that emit oxygen and feed on carbon dioxide through the stomata. I did tell them that if we cut down the trees, it means that we shall no longer have enough oxygen to breathe in as human beings. Not only that but the trees that used to feed on carbon are no longer in place. *Tanzania 1*

> We told the communities that without the forests there would be no oxygen. *Indonesia*

Payments for carbon

Two elements can be identified within this theme: The first is in regard to who will pay

and why; the second concerns how the payment is calculated and received. As previously mentioned, explaining the carbon market to project beneficiaries is considered as equally, if not more, challenging as explaining carbon itself. For some this means avoiding treating the topic in depth:

> [We] focused on the message of saving the forest and told them industrialized countries in the West wanted to pay money to help them achieve that. *Indonesia*

> I was asked not to go into deep details about these payments. *Tanzania 1*

Others make clear that western companies are prepared to pay for the community's efforts to conserve trees in order to continue their polluting activities.

> We briefly explain that people that need to reduce carbon emissions will purchase carbon credits from this project. *Brazil*

> I talk about how limiting the emission of warming gases is expensive or sometimes impossible, heavy industry and trucking, and so companies are looking for ways to pay others to remove the warming gases they emit. *Kenya*

> [We say] there is an initiative for companies that generate greenhouse gases going into the atmosphere to pay because we maintain our forest. However these companies must be willing to reduce their emissions and then economically recognize the opportunity we have to keep our forests. *Guatemala*

> [L]arge organizations and leaders of the world have joined forces to compel the owners of machines which, by the gas they emit, unbalance the world and threaten all humanity - to give part of their profits to encourage and support those who protect and work for the development of trees. *Burkina Faso*

Nonetheless, why they might do so is not always understandable to project beneficiaries:

> [The hardest thing to explain is] the fact that companies might want to pay them for making better soil here in Africa. *Kenya*

Some communities may draw on prior experiences in conservation funding to understand this rationale:

> The best explanation was given to me by a local person. He said 'so you will pay us for a bird, only you don't want to take the bird away but to have it free here where it belongs'. Every community extracts its own explanation, and sometimes it is very useful to bring it on other places. *Colombia*

The issue of how carbon can be measured in order to calculate payments represents a practical concern to communities and requires more complex explanation:

> So if for instance after two years we found out that the amount of carbon emitted to the atmosphere was reduced to 200 Kilograms, this means that the community would be paid for the 600 Kilograms of carbon the community managed to reduce through various efforts. If for instance each kilogram of carbon was paid 10,000/- Tshs, it means that we could get (600x10,000= 6,000,000/-). This would be the money paid to the participants. *Tanzania 2*

> We explain to them that […] a complex system of calculation allows us to know the amount of gas called carbon that your trees are able to capture over a certain period. That is to say, […] the bigger the tree the more carbon it captures, […] it is the biomass of the tree which is calculated. In simple terms if we were to burn the tree is the weight of charcoal that would be produced that we would consider as the weight of carbon captured and this is extrapolated to the scale your forest. *Burkina Faso*

Methods of communication

All facilitators reported that they use the local language of the community –in one case through a translator. Most also employed visuals aid, especially diagrams and drawings to communicate ideas. With regard to the use of local knowledge, some drew on local experiences of climate change and traditional beliefs related to conservation and

resource use to reinforce their message. None of our respondents explicitly used indigenous knowledge or cosmology to talk about carbon, although our Colombian respondent suggested that some accordance between indigenous worldviews and carbon concepts was identified by the communities themselves and she reinforced that:

> After explaining carbon, usually people feel that it is not something new, is just their ancestral relationship with nature, explained differently and under other names. It is important to recognize that knowledge. Usually I begin by saying 'ok, it took us a lot of time to understand that to us, but now we do, and what we can give you now is the science to know how to measure it'.
>
> People understand nature in a very profound way, some see it as their gods, other as a mother, but they all live and breathe this knowledge, what we do is just relate that with this new trend. *Colombia*

In contrast, in Ghana our respondent raised the issue of potential conflict emerging from differences between knowledge systems:

> Sometimes we mention the concept in English and try to describe using the local language and this brings a lot of questions from the community members. Most of the questions are issues they bring up to challenge what were are explaining to them because in most cases, they see such issues as myths and have different understanding and explanation to them. *Ghana 2*

Discussion

In order to make carbon tangible to communities not familiar with atomic theory, our interviewees draw on their audiences' pre-existing knowledge of soot and smoke as pollutants or irritants to allow them to imagine the impact of carbon in the atmosphere. Global warming, characterized as local peoples' experience of drought or changing weather patterns, is explained as the consequence of the damage inflicted on the atmosphere by 'noxious' carbon causing more of the sun's rays to reach the earth and/or

the accumulation of heat associated with emitted carbon (hot smoke, warm breath).

These explanations draw on people's experiential knowledge of the transfer of heat. Similarly, the transfer of carbon into the atmosphere is illustrated through people's experience of combustion. None of our respondents explicitly used indigenous knowledge or cosmology to talk about carbon cycling although one of our informants suggested that there was a possibility to link carbon cycling with indigenous understandings of nature. This is an area that would benefit from further research. At present it is clear that a 'correct' scientific understanding of carbon is not always communicated; this study suggests there is a need for greater debate around the level and type of understanding that projects are aiming for and what is required to achieve 'informed' consent. This is a question that is not widely addressed (if at all) in the carbon project planning and management literature.

Our interviews suggest that significant effort is made to communicate carbon concepts to communities. Their success in doing so is beyond the scope of this research, but our respondents' accounts imply that this understanding is partial and limited. A further problem with poor communication is that the knowledge imparted in sensitization activities can be a source of concern around oxygen, the air and breathing. In the present study it is clear that some facilitators do raise the threat that without trees there will be no oxygen, and one respondent mentioned that this was a question raised by communities.

Finally, we note that although development interventions seeking to combat issues such as soil erosion or deforestation have often shown a tendency to reinforce narratives of local blame for environmental degradation (Leach & Mearns 1996) this does not appear to be the case in the context of these projects. In the current study, although some of our facilitators do create links between land users' current practices

(deforestation, burning) and climate change, the localization of blame is far from ubiquitous, facilitators mainly emphasize the role of foreign countries or businesses in climate change. This information is important for explaining projects because the placement of blame elsewhere is central to the rationale for payment: facilitators explain that large companies are prepared to pay to compensate them (the local community) for clearing up their (the overseas company's) pollution.

Conclusion

Carbon communication within local communities is an area where 'local messiness' appears to be largely invisible to the global gaze of new environmental governance regimes (Asiyanbi 2015); and provides a clear example where guidelines dispatched to the periphery belie the reality on the ground. Investigating this messiness is vital due to the centrality of effective communication to safeguarding and because poor communication between project stakeholders reduces the opportunities for carbon projects to reflect local ecologies, values and needs (Leach and Scoones 2015).

This study suggest that greater attention needs to be given by planners as to the role of communication in projects. The volume of information carbon projects are tasked with communicating is potentially overwhelming. Managers therefore need to consider what information to prioritize, what is wanted and needed by local communities (Week et al. 2014), and also how best to deliver it. Ideally, developing a communication strategy should be done with representatives of communities themselves in order to explore the best methods of conveying information and the possibilities of drawing on local understandings. This is an area of research that we feel has been neglected: a focus on the question of the potential for co-production or integration of knowledge in climate change research and management ignores the reality that for most communities information is simply imposed, and distracts from analysis of how

knowledge is being formed everyday on the ground, and the potential for communities to shape this. Further research will explore in depth the processes by which existing belief systems are absorbed or supplanted in the creation of carbon knowledge. This field of enquiry presents an opportunity for critical researchers concerned by the marginalization of other knowledges and ontologies through processes of neoliberal environmental governance to respond to the appeal of McGregor, et al. (2014) to engage with practice-oriented researchers in pursuit of environmental justice.

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Figure 1. Illustration from community training manual. Source: Asia Indigenous Peoples Pact (AIPP) and International Working Group for Indigenous Affairs (IWGIA) 2012. *The Forest is Life: Knowledge for Communities* pp.19

Table 1. How to Popularize and Translate Carbon Sequestration Messages without Losing or Confusing the Essential Meaning. Source: World Agroforestry Centre (2011).

Principles
- Start from the perspective of the community, i.e. through an understanding and respect for their own knowledge and experience, and things that they can relate to
- Define carbon sequestration in the local language(s) and context, using terms that they are familiar with
- Dramatize the reason it is important for them to sequester carbon
Tactics and Tools
- Use of metaphors and proverbs
- Use of drawings and diagrams, giving concrete examples
- Use of film clips, documentaries, plays
- Citing local examples of weather-related events they have dealt with, such as a disease outbreak, flood, drought, etc.

Appendix 1. Interview question guide

Part 1: Background information
1. What is the name of the project that you have been involved in? 2. What stage of development is this project at? 3. At what stage of the project was carbon explained to the community? 4. In what setting were the carbon concepts explained? Was this to individuals or groups? 5. When did sensitisation activities take place (dates):
Part 2: Explaining carbon
1. When you introduce the idea of carbon to a community how do you begin? Can you explain everything to me as if I were a project beneficiary?

2. Do you explain the idea of carbon offsetting (that someone outside the community will pay for this carbon capture?) If so, how do you do this? Again – if possible speak to me like I am a beneficiary.
Part 3: Methods 1. What language do you use when explaining carbon? 2. Is this the mother tongue of the community? 3. Do you use any visual aids to help explain carbon concepts? 4. Do you use any local concepts or metaphors when explaining carbon?
Part 4: Challenges 1. What are the most common questions or concerns from community members? 2. From which members of the community do these come? 3. Did community members draw on any particular local knowledge or experiences to make sense of carbon? 4. Which aspects of carbon projects are the most difficult to explain? 5. Which aspects of carbon projects do beneficiaries find hardest to understand?
Thank you for your time. Are there any points about explaining carbon that you think we have missed or you would like to make?

Appendix 2. Codes and themes

Theme	**Code name**
Difficulty of explanation	Intangibility
	Difficult-complicated
Explaining what carbon is	Methods-approaches
	Analogy
Dangers of carbon	Pollution
	Disease
	Climate change impacts - local
	Climate change impacts - global
Carbon capture	Carbon cycle
	Deforestation
	Role of trees
	Oxygen
Payments for carbon	Carbon calculation
	Responsibility
	Carbon market
	Consumption
Concerns about projects	Carbon rights
	Project impacts
	Access
Cross-cutting	Traditional knowledge

	Role of facilitator