“It *Becomes* Scientific…”: Carbon Accounting for REDD+ in Malawi

Heather M. Yocum[1]
University of Colorado

Abstract
This paper provides an ethnographic case study of project planning meetings during which meticulous accounting procedures are used to convert social and ecological life into marketable carbon credits. A focus on the micro-processes of carbon credit production reveals the politics informing the creation of these seemingly objective numbers and statistics. These accounting methods strip away the specificity of the social-ecological system, converting them into interchangeable carbon units. This process lends legitimacy to an otherwise imprecise set of accounting practices and translates social and ecological data into forms legible to transnational commodity markets and investors. These ostensibly standardized and objective accounting techniques are enacted by the different actors as they negotiate asymmetrical power dynamics during project planning meetings. This results in a particular narrative which selectively highlights different aspects of target communities and forests in ways that depict them as appropriate for carbon development and make them attractive to potential investors.

Key words: climate change, forests, Africa, carbon markets, conservation and development

“We literally invent this stuff. It is not clean or pretty…We generate these numbers. What we’re doing, it seems like a lot of guesswork, but then [the modelers] put it in their model and it becomes scientific.” *--carbon developer, February 15, 2012*

Introduction

This paper describes one aspect of the process through which carbon credits are defined, measured, and made saleable, with a particular focus on the meetings during which carbon offset project activities are converted first into avoided emissions and later into marketable carbon credits. The opening quote refers to the process through which guesswork and best estimates are used to convert social and ecological life into marketable carbon credits. On the one hand, this guesswork “becomes scientific” as qualitative narratives about social and ecological life are translated into seemingly objective numbers and statistics that are legible within the framework of international carbon markets. On the other hand, invoking the “scientific” nature of these numbers lends legitimacy to an otherwise imprecise and emergent set of practices. This discourse of precision and accuracy is necessary in order to receive validation to produce credits for the voluntary carbon market as well as to attract potential investors to purchase these offsets.

This process of “becoming scientific” masks the social relationships and power asymmetries through which these credits are produced. These numbers are not objective, pre-existing data, waiting simply to be discovered and recorded; rather, these numbers are created through specific procedures that are subject to unequal relations of power between project

[1] Heather M. Yocum (heather.yocum@gmail.com) is postdoctoral research associate at the Cooperative Institute for Research in Environmental Sciences at the University of Colorado, Boulder, CO, USA. She researches natural resource management and climate change in Africa and the western United States.

planners. As these actors collaborate to produce these numbers, they simultaneously negotiate the creation of a particular narrative that will secure their long-term interests and depict the project as the optimal choice for potential investors.

The following is an attempt to unpack this process, paying particular attention to the micro-processes that make the production of carbon credits seem "scientific" and legitimate while at the same time obscuring the social processes that inform their production. In February 2012, I was invited to observe a series of planning and budget meetings for a carbon project that I was studying as part of a larger research project. During these meetings, a community organizer and a representative from a carbon development firm (hereafter, the carbon developer) met to fill out a planning matrix detailing the livelihood activities planned each year for the thirty-year project. The numbers they generated to fill in this matrix were destined to become variables in complex model equations that would eventually result in a calculation of net emissions reductions that could be sold on the carbon market. At the conclusion of the meetings, the carbon developer explained that the numbers they had generated would be sent to statisticians and modelers in the US, saying, "We literally invent this stuff. It is not clean or pretty…We generate these numbers. What we're doing, it seems like a lot of guesswork, but then [the modelers] put it in their model and it becomes scientific." This paper is based on participant observation during these meetings as well as personal communications with the carbon developer and community organizer who were present.[2]

Producing Carbon Credits

Carbon offsets are an abstraction of the second order, since they are based both on the commensurability of emissions across time and space throughout the globe but also depend on a set of actions meant to reduce the amount of those emissions by engaging in some type of emissions-reducing activity (cf. Lohmann 2010). The process of producing carbon credits for the market requires stripping away the specificities of social and ecological life. The translation of these complexities into numbers and statistics is one way that this is accomplished. This includes making forests in different places across the globe equivalent in spite of their ecological differences and casting forest-dependent communities as producers of carbon offsets (Sullivan 2009). In order for this to happen, potential "containers of value" (Robertson 2012, 389) must be first be divided into discrete units that can be represented numerically, after which each unit can be assigned a monetary value (monetized) and subsequently traded on the market (financialized) (Lohmann 2011; Sullivan 2012). It is this first step—the creation of these discrete units and the ways that these units are represented numerically—that I will focus on here.

Producing carbon credits for an avoided deforestation project such as REDD+ involves the creation of two different fictitious narratives based on model projections for the future: one for the baseline scenario, since it assumes that trends in deforestation from the recent past will be continued into the future; and the second for the project scenario, which estimates the amount of emissions that will be avoided because of the carbon project. Emissions reductions in the project scenario come from the livelihood and development projects designed to reduce the demand for forest products in forest-dependent communities. Project planners determine how many trees, and by proxy how much carbon, will be saved by various project activities (Terra Global Capital,

[2] My attendance at these meetings was part of a larger project which included 12 months of fieldwork in 2009 and 2011-12 with project planners, natural resource managers, and forest-dependent communities living near protected areas in Northern Malawi. Parts of this article appeared as chapter of my dissertation (Yocum 2013).

LLC and Total LandCare 2011). This project scenario represents the work that is necessary in order to translate social life into carbon equivalents.

The equations, models, and tools that make social and ecological life equivalent to carbon units are used to translate imprecise guesswork and estimates into units of measurement that are legitimate in the eyes of project planners, verifiers, and investors who will buy the carbon credits. This is done through the use of complex model equations developed as part of an accounting methodology that can be used to estimate the amount of carbon offsets produced in any project, in any part of the world (cf. Terra Global Capital, LLC 2014). For the projects discussed in this article, the methodology is 182 pages long, while the model has over 90 primary variables, each of which is comprised of multiple, constituent variables. These variables are numerical representations of the carbon stocks that are estimated to be in the target forest area, as well as the estimated amount of carbon that will be conserved by the REDD+ livelihood projects. The numbers used to generate these variables come from project planning matrices like those discussed in the meetings described below. The types of numbers and graphs appearing in matrices, models, and the accounting methodology are "particularly convincing and reputable" (O'Reilly 2015), an important attribute when creating marketable assets from the conservation of forests across the globe. In this way, "becoming scientific" is directly related to becoming marketable, since it is the translation of social and ecological complexity into the simplified, universal language of numbers and statistics that links forests and forest-dependent communities to carbon markets and investors.

The production of carbon offsets is an inherently political project since it entails redefining the factors governing rights to the resources in question. REDD+ projects require the identification and (re)definition of both forest areas and beneficiaries (Mahanty et al. 2012), and the re-ordering of existing property rights through "land-use planning, delineation of forest boundaries, and identification of rights-holders" (Milne 2012, 693). This process necessarily simplifies representations of the range of legal and customary practices that govern access to forest resources, recognizing certain uses and users while obfuscating others. Market-based conservation, far from being neutral, privileges certain ways of understanding and knowing the non-human world over others. Sullivan (2002; 2009) questions the politics of market-based conservation and ecosystem services as a unifying language, asking who is able to contribute to the construction of these narratives, who is left out, and to what effect. Empirical studies from across the globe have demonstrated that carbon forestry projects can destabilize national forest policy and undermine community property rights and access to forest resources (Filer and Wood 2012), lead to violent attacks and evictions from forest areas (Checker 2009), and create winners and losers within communities as project beneficiaries are identified (Milne and Adams 2012). In Malawi, carbon projects have resulted in increased legal access to forest areas for communities while stripping away de facto access to these resources by increasing patrols to reduce unsanctioned resource extraction (Yocum 2013).

However, these numerical representations erase social-environmental interactions, obscuring the entangled relationships between people and forest spaces. Forests have come to be the way they are through a combination of ecological processes and social intervention (Sheridan and Nyamweru 2008; Vandergeest and Peluso 2011). In Malawi, this includes cultural and spiritual practices governing resource use as well as the forced removal of villages to create protected spaces for forests and wildlife (Department of National Parks and Wildlife 2004a; Department of National Parks and Wildlife 2004b; McCracken 2006; Morris 2001; Yocum forthcoming). When the context is removed from carbon projects, communities are portrayed as the primary threats to forest spaces rather than as important components of the human-natural system (Beymer-Farris and Bassett 2012). This both casts the communities as the primary targets for intervention to solve the climate crisis as well as obscures processes and trends in the global political economy that create conditions of poverty, forest dependency, and climate change in the first place (Bond 2008; Lohmann 2008).

Counting carbon requires deciding what carbon will be counted and what will not, which ultimately occurs at the project level. Quantifying the amount of carbon in the global carbon cycles requires a massive amount of guesswork (Günel 2012; Lohmann 2008; 2010; 2011), and estimates across a single forest can vary wildly.[3] However, in order to understand the "necessary steps involved in making not-cutting-down-trees a commodity that can be…traded on the carbon market" (Stephan 2012, 622), it is helpful to examine the quotidian, micro-processes that take place during planning meetings (Filer 2009; Carrier and West 2009; MacDonald and Corson 2012). Examining the actors and networks that produce marketable carbon commodities exposes the politics that inform their creation (Hayden 2003; MacKenzie, Muniesa, and Siu 2007; Mackenzie 2009), and can expose how depictions of the way the world is (or how we perceive it) become a guide for how the world ought to look (Carrier and West 2009; MacDonald and Corson 2012). The study of these micro-processes makes visible the politics that inform in the creation of the variables for these projects. But these variables aren't defined randomly; they are produced in a way that reflects the negotiated priorities and interests of the actors who are involved in creating them.

The Project

The carbon project discussed in this case is part of a five-year (2008-2013) conservation and development project which targeted approximately 225,000 people living in communities located within five km of Nyika National Park and Vwaza Marsh Wildlife Reserve, adjacent protected areas in Northern Malawi (Terra Global Capital, LLC and Total LandCare 2011). The target communities in the Nyika-Vwaza areas are represented by an umbrella organization, the Nyika Vwaza Association (NVA), and represented by an elected community organizer. The carbon development firm selected this community organizer to represent the communities during project planning meetings and to introduce the communities to the carbon project plans.

During the project planning meetings, the community organizer and the carbon developer worked jointly to estimate the emissions reductions from the project's livelihood activities. Both the carbon developer and the community organizer had vested interests in creating a successful carbon project. Not only do the numbers generated for this project have to fit into the prescribed model that the carbon development firm has been approved to use, but they must also portray a social-ecological system that is ripe for carbon development and investment. However, this is an uneven negotiation with particular power dynamics that reflect the positionality of the actors involved.

From its very inception, the methodology used to guide the production of these numbers is designed to reduce investor uncertainty and risk. The carbon development firm is a for-profit firm that will only survive if carbon stores increase, if their projects are competitive on the

[3] A full discussion of this topic is outside the scope of this paper, but for more information on biomass surveys, see (Terra Global Capital, LLC 2010) and (Yocum 2013). For discussions of specific methodologies for measuring carbon in above- and below-ground biomass, see (Chave et al. 2005). For a discussion of the margins of error in different measurement techniques in general, see (Jerome Chave et al. 2004), and (Ryan, Williams, and Grace 2011) for the woodlands of Southern Africa in particular.

carbon market, and if they are able to attract investors. According to project planners, it is the detail of the project scenario—of the estimates generated in the meetings described below—which results in better estimation of potential carbon stocks (Interview, February 2012). This increases investor confidence and gives this particular carbon development firm a competitive advantage in the carbon development sector (Interview, February 2012). The ability to attract investors makes a real difference in the outcome of the projects as other carbon projects in Malawi have failed when they were unable to locate buyers for their carbon credits (Yocum 2013).

Likewise, a key part of the community organizer's role during these meetings was to provide the numbers necessary to support the carbon project in order to procure much-needed development for the communities he serves. The community organizer has much less leverage to advance his priorities than the carbon developer. As the "local expert," he was careful to downplay the realities of illegal activities within the reserves, speed up the timeline for meeting benchmarks, and portray the community as excited partners of the carbon project. Furthermore, as a community organizer, he influenced how project benefits would be distributed amongst target communities. In the future, after his tenure as a community representative ends, he could be hired by the carbon developers as their community liaison. Therefore, his ability to secure resources for his family and community depended on his ability to ensure the carbon project's success and to remain on good terms with project planners.

Generating Data

The primary purpose of the planning meetings that I attended was to generate the project scenario. This was done by estimating the impact that planned livelihood activities will have on the emissions reductions. For example, one project activity involves the creation of village woodlots to meet the communities' needs for firewood and building materials. Once the project planners know how many trees can be planted each year and when those trees will be ready for harvest, they can estimate how many trees will be saved, and by proxy the amount of carbon conserved. A less straightforward example is the planned distribution of goats. Once the potential monetary gains from goat raising are calculated, they are used to calculate how many trees might be saved by this alternative source of income, and after accounting for the additional methane produced by the goats, the potential reduction in emissions can be measured. These numbers from the tree planting and livestock projects become variables in calculating and graphing the emissions expected under the project scenario.

These equivalencies are calculated by filling out a large Excel-type matrices. The work plan matrix detailed the component activities and sub-activities of each livelihood project, broken down by year. These numbers were used to fill in a second matrix of project scale-up activities documenting the percentage completion of each livelihood activity for every year of the project. The carbon developer projected these matrices onto the wall of the office so that the community organizer and I could see it. The project ramp-up matrix was over one hundred columns wide and thirty rows long, and it listed the activities identified in the work plan on the X-axis at the top, and the years zero to thirty along with the corresponding calendar years from 2010 to 2040 on the Y-axis. These spread sheets became the focus of the meeting, as we all turned our attention to filling in the empty boxes of the matrices.

Guesswork

One of the first project activities discussed was income-generating activities from small-scale beekeeping and macadamia nut production. The carbon developer noted that this number was zero in 2010, meaning that beekeeping had not yet started. Then she reconsidered this, saying, “Well, maybe it’s not zero. It has already started, so maybe not.” The community organizer agreed and then described the current actions of extension officers and the community beekeeping groups. The project developer said that macadamia nut production had also begun, so maybe the number should start at five percent of the overall goal. The community organizer suggested that the figure should increase by ten percent annually because as people participated in these new projects and programs, other people would see this opportunity and rush to adopt it. He said that was his guess. The carbon developer typed this in, and continued to input numbers down the column for each subsequent year, with gradual increases.

It is important to note that these estimates were not based on the number of people or households currently involved in these activities, nor was there any discussion about the actual numbers of additional people or households needed in order to achieve an annual increase of ten percent. The project developer repeated that this process was “total guess work.” The community organizer agreed that there had “not been a study,” but nevertheless responded, “I live there, I work with the communities, I work with them every day. So I know a little bit.” The project developer said that the purpose of this meeting was just to “get a big picture.” She reiterated that the entire process was “kind of a guessing game, really” but that was acceptable because these numbers would eventually be fed into a model and combined with additional data from household surveys and biomass estimates that would increase their validity. Then they moved on to the next topic.

Tweaking the Numbers

Even when actual numbers or best estimates were available, they were tweaked so that they fit into the matrix. For example, activities to increase community understanding of the project’s conservation goals were planned as part of the effort to strengthen local institutions involved in natural resource management. When asked about this activity, the community organizer responded that they need to strengthen the NVA by building capacity. The project developer asked him about a timeframe, since the matrix was broken down by year. The community organizer responded that the timeframe is ongoing: the communities held elections every two or three years and there were always new members who needed to be trained, so therefore capacity building is continual. The project developer agreed, but said that at some point they have to report that 100 percent of this activity has been achieved, even if the activities are still ongoing. She said any number less than 100 percent in the planning matrix would negatively impact the estimate of how much carbon could be offset by this specific activity. She reminded him that the percentage of completion for each project activity should be based on the indicators identified in the project work plan as dictated by the model, not on if 100 percent of the community members were actually trained or not. He asked her what she thought the numbers should be. They agreed on a percentage and a timeframe and the project developer entered those numbers into the matrix.

In this case, the community organizer was the best person to give the most accurate numbers to answer this question. He was explaining the way that the umbrella organization and the village-level NRCs work. The numbers that he initially provided are perhaps one of the most accurate and sophisticated estimates generated at any time during the meeting, since he organized the elections and conducts the trainings. The community organizer saw capacity building as a dynamic, ongoing process of engagement between communities, department officials, and NGOs; however, this type of community organizing did not fit into the model, so instead of an ongoing process it was artificially reduced into a series of benchmarks that was more easily translatable into carbon units.

Recursive Variables

At times, these emergent variables became imbued with credibility as they were used as stand-ins to reduce the guesswork in filling out other parts of the matrix. One item on the matrix was the strengthening of local institutions, referring to the community-based natural resource management groups represented by the NVA. The carbon developer began by asking the community organizer about the relative sizes of the NVA and a new community group forming in Nkhotakota Wildlife Reserve, an additional area that the carbon development firm hoped to include in the carbon project. The project planners were providing training in carbon forestry management and financial support to the resource managers and community organizers in Nkhotakota with the hope of expanding the carbon project to this and other protected areas in Malawi. Since both the Nyika-Vwaza and Nkhotakota areas will eventually be incorporated into the carbon project, both had to be considered when filling out the spreadsheets. The community organizer suggested that they report that sixty-six percent of the community organizing had been achieved in Year One, since the NVA was already operational in two of the target areas, but the association in Nkhotakota was still organizing. The project developer accepted this and types sixty-six percent into the excel file. She also noted that they did not have a separate operating budget for Nkhotakota and suggested that they simply halve the budget that they had already generated for the NVA. The chairperson agrees, and the numbers are entered into the matrix.

In this way, the target communities and their institutional relationships with the state were made into interchangeable units through the use of numbers in the matrix. Although the community organizer had only met the Nkhotakota organizer once, and despite the very real differences in culture, language, geographic area, population density, history, and ecology between the Nyika-Vwaza and Nkhotakota areas,[4] the community organizer was expected to serve as the expert for all of the communities which would be included in the project. The budget for conducing organizing activities in Nkhotakota was also based on the NVA budget, despite the fact that the NVA represented several times the number of people spread across a larger geographic area than the Nkhotakota group. This made the protected areas and the associated community-based organizations equivalent units in the project matrix, expressed as interchangeable numeric variables that would be fed into the model.

Likewise, communities and forest spaces in different parts of the globe were also made equivalent through this process. For example, when it was time to enter the percentage of the tree-planting project which would be accomplished annually, the carbon developer and the community organizer were unsure which values to insert. The carbon developer suggested they look at the carbon development firm's projects in Cambodia to identify sample annual percent increases for tree-planting. However, the Cambodia project targeted village forest areas, not forest reserves and woodlots as in the Malawi project. This led to a lengthy discussion of the

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[4] Nkhotakota Wildlife Reserve is located in the forested hills near Lake Malawi in the Central Region. The majority of people in Nkhotakota are linguistically, culturally, ethnically, and religiously different from those in Nyika and Vwaza. The ecosystem in Nkhotakota is hotter and drier than Nyika-Vwaza. Its proximity to Lake Malawi also means that there are different resource-use patterns and pressures, such as felling hardwood trees to carve dugout canoes and to carve souvenirs for the tourists visiting the lake.

commensurability of these different categories of forests and the institutional arrangements governing the use of forest resources. This confusion prompted to check how much leeway they had in the carbon accounting model and matrices. However, there was no discussion of the social, historical, or ecological differences that might affect the species of trees to be planted or their growth rates. In the end, the carbon developer and the community organizer decided that the numbers from Cambodia could be used for the Malawi case, and the developer copied a long column of numbers from the Cambodia project directly into the Malawi matrix. The use of the Cambodia numbers illustrates the way that forest spaces and forest-dependent communities were constructed as interchangeable, equivalent units. In this way, these particular variables become recursive, gaining credibility as they are moved further from their source and through their re-deployment become legitimate guidelines for other projects in different parts of the globe.

Selective Vision

Much of this process of becoming scientific requires determining what can and will be counted. For the project, only some emissions are counted. For example, there was a line in the planning matrix to account for the potential future emissions of a bus to transport value-added forest products like honey, juice, and jam from the rural areas to markets. Similarly, the model accounted for the methane emissions of the goats in livestock program. However, there was no place to account for the emissions that the carbon developer created during her trips between the US and Malawi (or for that matter, for the emissions of researchers like me studying these projects). Another example concerns tree-planting activities. For the project scenario, only the trees planted on community land were counted and not the numerous smaller woodlots established and maintained by individual households. During interviews, many community members were confused as to why they would not be paid for trees they planted on their own land. Only the carbon from spaces targeted for carbon development can be verified, marketed, and sold under this project. On the one hand, this makes sense from the perspective of project accounting since only the carbon saved through project activities count as reduced emissions; however, any tree—no matter its location or the impetus for planting it—is actually sequestering carbon, a point which many of the community members were quick to point out during interviews. As this case demonstrates, not all carbon is accounted for during this process and therefore the formal numbers which appear in the accounting methodology are only a partial reckoning of the total amount of emissions generated or conserved within the target area.

Discussion

What the carbon developer taps into when she says the process "becomes scientific" is the encounter with the matrices which generates viable numbers out of the qualitative complexities of social-ecological systems, producing a simplified narrative that is legible to and ready for market transactions. Viable numbers are those that project validators understand as comprehensive and reliable which can sequester carbon and account for those avoided emissions, and that investors will believe are a sound investment that minimizes their financial risk and maximizes future earning potential.

Describing the micro-processes through which these numbers are produced exposes three important points about carbon accounting. First, these numbers involve a substantial amount of guesswork, but that guesswork assumes an air of objectivity and precision as these numbers move from the matrix to the model and into the market. This happens when the qualitative complexity of social and ecological life are converted in quantitative values through the use of planning matrices and then converted into variables which are then fed into very complex and highly technical model equations. These equations assign different weights and relative values to the different variables, further removing them from the guesswork and estimation that produced them in the first place. This guise of precision and accuracy allows carbon credits to be transferable via international carbon markets. Without this perceived precision, carbon projects could not produce marketable assets out of emissions reductions, and the entire project would be a non-starter. However, the seemingly objective numbers disguise the politics that inform their creation.

Second, the numbers in the project scenario are not generated as an objective description of the growth of carbon stocks; rather they are the reflections of a particular agenda that is legitimized through the trope of quantitative valuation and scientific objectivity. These accounting practices create numbers which translate social-ecological complexities into particular narratives that fit both the dictates of the statistical model and the needs of future investors. This is accomplished through the mobilization of a carbon accounting model which determines which activities and emissions reductions count and which do not. The numbers which will become variables in the model are ultimately negotiated by the actors who produce them as they seek to maximize their interests as much as possible within the confines of the planning matrix. However, these negotiations between the community organizer and the carbon developer depicted above are subject to asymmetrical power relations, in which the community organizer has much less leverage to advance his particular agenda. This is due to the fact that the carbon developer has the necessary professional and social connections to create this carbon project and take the credits to market, or not as the carbon developer deems fit. As demonstrated through the capacity building example above, the community organizer at times capitulated to the carbon developer's opinions about the speed of project roll-out for the livelihood activities even though he was the local expert who was ostensibly there to provide that level of detail. However, the organizer was also able to influence the production of these numbers to some extent by depicting the communities as single entities that were receptive to the project and who already had experience engaging in beekeeping, tree planting, and other planned livelihood activities. The picture painted by the numbers and variables generated through the planning meetings described above is one of a forest that is a good option for carbon investment and communities which are enthusiastic partners in the proposed project.

Third, this process results in prescriptive and recursive numbers that support a particular way of managing diverse social-ecological systems (cf. Agrawal 2005; Latour 1999). These variables that depict social and ecological life become both representations of particular aspects of the social-ecological system as well as goals for how the target forest and communities should be managed. The numbers in the planning matrix represent yearly benchmarks for each separate component of the planned livelihood projects. The numbers in the matrix are not observations, but projections of the emissions reductions that could materialize under the carbon project under project conditions. As such, the numbers and variables that are used to calculate carbon credits become the guide for how to manage the project, and by proxy the target communities and forest areas as well. The model itself is designed to be portable from one project to the next; however, such a one size-fits-all model cannot account for different types of numbers or categories that might be necessary to accurately depict different forest areas and social arrangements for governing them in different parts of the world.

Ironically, my field notes themselves became part of this process. At their request, I provided the project planners with a shorter version of my field notes as meeting minutes. While

I saw my field notes as documentation of the gaps and disjunctures in project accounting procedures, the carbon development firm used the same set of notes to illustrate the comprehensiveness of their consultation process with the target communities. For them, this process demonstrated the precision and accuracy of the numbers they were generating. This discrepancy between the way that the carbon development firm and I understood the production of the project scenario illustrates the extent to which trust in the model can imbue guesswork with validity and credibility.

Conclusions

The opening quote illustrates the connectivity between the process of quantifying social and ecological life into distinct variables and the legitimacy these units gain as they are codified into market forms. In "becoming scientific," only particular qualities of the social-ecological system become invisible. What remains visible is translated into a quantitative form that serves as a lingua franca for the carbon market and those involved in it. These numbers are ultimately about selecting what to bring to the fore, what to obfuscate, who will benefit and in what ways. These choices result in a particular narrative, supported by variables, statistics, and numbers produced in these types of project planning meetings, that privileges specific ways of managing social-ecological spaces. The very process of accounting for carbon credits is influenced by their eventual destinations: the carbon market and the portfolios of potential investors.

These projections are given legitimacy through an intricate set of accounting practices that transform ecological and social life into discrete, measurable units that can be converted into carbon equivalents. The guesswork and estimation that go into producing these credits disappear through meticulous accounting practices that hide the contingent and emergent nature of these numbers. The matrices used to create the project scenario are used to translate the seemingly endless complexity of the real world and organize it into categories that can be measured, compared, and exchanged. The matrices are used to produce equivalencies between non-equivalent things, such as diverse forests and communities across Malawi and the globe, or between diverse activities such as the number of goats distributed in a given year with the number trees planted in a woodlot.

This case study demonstrates how even "scientific" processes of measurement and accounting are subject to the social contexts in which they are made, even as the model itself structures this process. The numbers in a carbon project are not ferreted out by new methodologies and practices, but rather conceived through these methodologies. The particular, situated knowledge of the actors involved in this process shaped the outcome of the project scenario by providing the estimated data that was used to project the future carbon emissions scenarios and therefore amount of saleable carbon offsets generated by the project. This guesswork gains credibility as it is translated into numbers and variables that resonate with particular narratives for understanding and managing social-ecological systems. These numbers can and do describe particular aspects of the complex social-environmental relations in this particular place and time; however, this partial account is just that—partial and subjective. The numbers produced can only ever paint an incomplete picture. When these synechdochal numbers are used as a proxy for the complexities of real forest spaces and forest-dependent communities, then this partial perspective becomes the lens through which that world is managed.

The translation of complex social-ecological systems into quantitative, numerical values requires guesswork and estimation—"highly technical, expensive, educated guesswork" (O'Reilly 2015, 123)—but guesswork nevertheless. Attending to the micro-processes that informs this guesswork exposes the politics that go into the creation of these ostensibly objective measurements and the application of those measurements into accounting practices for carbon projects.

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