

# Monitoring Forest Governance: A Field-Based Approach from Tanzania

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## Abstract

Any effort to reduce emissions from deforestation and forest degradation (REDD) requires knowledge not only about the factors that cause over-time variation in forest conditions but also how current policies, programs and other human interventions affect such causal processes. With the emergence of a global REDD program-- designed to induce developing countries to improve the governance of forests so as to reduce deforestation rates--an increasing number of analysts and practitioners are concerned with the assessment and monitoring of forest governance in participating countries. Most current efforts in this area have developed methodologies for assessing forest governance at either the aggregate, national level *or* at a localized project level. Here, we propose a practical approach to combine field-level measurements with aggregate estimates. The approach, which is called the National Forest Monitoring and Assessment (NFMA), combines direct measurement of vegetation, with observational and interview data in a large number of sample plots. The Government of Tanzania, supported by the Food and Agriculture Organization of the United Nations, recently started implementing its first NFMA and here we draw on the Tanzanian case to analyze the extent to which the methodological approach of NFMA is useful for Tanzanians who are concerned with improving forest governance performance in the country. We find that the main strengths of the NFMA lies in its ability to estimate (a) contextual drivers of variable forest conditions, (b) people's organizational efforts to secure access, use and manage forest resources; and (c) the relationships between forest users and a series of external governance actors, including the national government. One of its main weaknesses is limited ability to gauge the quality of governance within the national government's administrative bodies. To address this limitation, we propose the development of a national-level measurement tool that complements the field-based NFMA by targeting actors that operate primarily at the national level.

## Introduction

The twin purpose of this paper is to present and analyze recent efforts to establish a national monitoring system for forests, forest use, and forest users in Tanzania, and to assess the extent to which the existing approach is useful for the monitoring of forest governance in general and REDD+ governance in particular.

The emerging global REDD+ program (Reducing Deforestation and Forest Degradation in Developing Countries) is grounded in the fact that about 20% of global CO<sub>2</sub> emissions come from land use changes, much of which occurs in tropical forests found in the developing world. At the wake of the COP 15 meeting in Copenhagen in 2009, the parties recognized that any meaningful strategy for mitigating climate change must address deforestation and forest degradation. To this end, the parties created the REDD+ program. To make REDD+ work, we argue that it is essential for participating countries to develop robust monitoring systems that can inform national policy makers about the drivers of changing forest conditions and how public policies affect these drivers. The challenge, as we see it, is about participating REDD+ nations learning how to build monitoring systems that will help them become better at governing their forest resources.

We define governance broadly as the process through which socially binding institutional arrangements are created, implemented and enforced. Forest governance is receiving increasing attention in international forest policy discussions, especially in relation to the preparation and implementation of a global REDD+ program. One of the reasons for the sudden broad interest in forest governance is likely linked to the fact that governance is a term that effectively captures many, or perhaps most, of the problems facing the world's forest resources today. Illegal logging, indiscriminate deforestation, corruption, land grabs, encroachments into protected areas, etc., can all be explained by poor governance at multiple levels. Although our definition of governance is broad, in this paper we seek to translate the broad, catch-all phrase into more concrete meanings in the context of Tanzania's forestry sector. In this context forest governance is about specific actions and programs that can address insecurity of property rights related to forest resources, providing communities access to participatory forest management programs, collaborating with private sector and local populations to conduct more effective monitoring and enforcement activities, strategically targeting areas that are most exposed to illegal logging activities.

While most experts now agree that governance monitoring systems are indeed urgently needed, it remains an open question as to *what type of data* ought to be collected and *how*. In this paper we seek to contribute to the methodological discussions about the design of robust and useful forest governance monitoring systems. We do this by presenting and analyzing the recent efforts of the Government of Tanzania to carry out a National Forest Monitoring and Assessment (NFMA). We argue that this FAO-supported approach, characterized by its field-based measurements, represents an important step towards establishing scientifically sound and practical monitoring systems. If made functional, such a monitoring system will help the country's many governance actors to learn about the state and trends of the country's forest resources, uses, and users. Such knowledge, in turn, will suggest ways in which Tanzanians might improve the effectiveness of current forest governance practices.

To analyze the methodology of the NFMA in Tanzania and how it may be used for assessing and monitoring forest governance, we consider three evaluative criteria: (1) responsiveness to forest sector stakeholders' priority data needs; (2) feasibility of testing explanations to forest condition variability; (3) extent to which forest governance parameters and so-called social safeguards for REDD+ are covered.

After providing a brief background on the NFMA methodology as applied in the case of Tanzania, we unpack and discuss the rationale behind our three evaluative criteria for assessing the overall

usefulness of the NFMA approach. We then apply these criteria to the case of Tanzania, and discuss what the main strengths and limitations are of this methodology. We conclude in section 5 by proposing further methodological development to better meet the needs of organizations interested in diagnosing governance problems and learning how to address them .

## Background

The Food and Agriculture Organization of the United Nations (FAO) is supporting the Government of Tanzania (GoT) to create an NFMA-based monitoring system called NAFORMA. This collaborative effort, which is implemented by Tanzania's Forestry and Beekeeping Division of the Ministry of Natural Resources and Tourism , seeks to provide a sound basis for national-level analysis and planning, broaden the knowledge base on forestry in the country, and enhance national capacities to monitor land use change (Government of Tanzania, 2009). The central aim of NAFORMA is to implement a scientifically robust and practical process for the collection, processing and analysis of field-level data on forest resources, their uses, and users. Data collection in the field, which is scheduled to be completed by the end of 2011, takes two forms: data on biophysical parameters collected through direct measurements and observations; and data about forest use and users collected through field interviews with a variety of local actors.

It is the integration of data collection through field interviews that is one of the most distinguishing features of the NFMA approach and what sets it apart from traditional forest inventories (Tompoo and Andersson, 2008). The basic rationale for conducting field interviews as part of the NFMA methodology is straightforward: It has the potential to increase the policy relevance of the results. The inclusion of data on the human use of natural resources and forests, if done properly, allows national forest policy analysts and decision makers to develop knowledge about the human factors that affect varying forest conditions within a country, something that traditional NFIs have not been able to deliver (FAO, 2009). Such knowledge makes it possible to monitor forest governance performance (that is, how effective the existing institutional arrangements are in achieving national policy objectives), which can help policy makers and analysts identify ways of improving public policy, actions, and programs . Hence, there are two expected outputs from conducting interviews in NAFORMA: (1) the monitoring of forest governance performance; and (2) the identification and monitoring of human drivers of forest change.

To actually produce the expected outputs, NAFORMA has developed a strategy that consists of an iterative learning process with seven stages or steps. Figure 1 presents this iterative process graphically.

[Figure 1 about here]

After the Government of Tanzania decided to invest in the creation of NAFORMA, FAO provided technical assistance to carry out a broad information needs assessment (stage 1) geared towards identifying knowledge gaps that may be holding back forest policy effectiveness. The results provided the input into the design of the inventory in stage 2-- which data should be collected in the field and how. Once the data collection protocol and sampling designs had been developed and field tested for practicality and efficiency purposes (stage 3), field crews were trained in data collection methods (stage 4). In stage 5, which is the most time-consuming stage, NAFORMA field crews collect data on a total of about 250 parameters in about 3500 sample clusters throughout the country. Once this data has been cleaned and entered into a central data base (stage 6), the government is responsible for making this data available for analytical work so that the results can inform ongoing policy discussions (stage 6). Such discussions may lead to national government decisions to modify existing policies in stage 7. They may also help non-governmental organizations make more informed and strategic decisions with regards to how and where they should allocate

their resources. The outcomes of the seventh stage is a new policy regime, which may create demands for new data to assess the actual outcomes of the new regime. Such data needs may be documented in the first step of a new iteration of the policy learning cycle.

### **Policy needs assessment**

During NAFORMA's inception phase, March-September, 2009, an assessment was carried out to document what forestry sector stakeholders in Tanzania perceived to be the most prominent gaps in terms of data, statistics and knowledge. A team of consultants, contracted by the GoT and FAO interviewed a total of 52 individuals working in 17 different organizations to get their perspective on which particular data gaps were most urgently needed because they are preventing current policies, programs, and other government-led activities from being effective. In addition, the consultant team asked stakeholders to offer their main hypotheses regarding what the main causes for deforestation and forest degradation are in Tanzania. The results of the stakeholder interviews were then systematically compiled into a preliminary report, which was used as background material for the national inception workshop for NAFORMA. The participants at the workshop produced a list of priority themes that both the biophysical and interview components should focus their data collection efforts on. As far as the interviews go, the workshop participants recommended that data collection should seek to measure multiple indicators in five broad thematic areas:

- Communities dependence on forest resources for their livelihoods
- Access to forest products and services and their consumption patterns
- Impacts of forest products collection to the forest resource and livelihoods
- Influence of existing policies on patterns of resource use decisions
- Capacity of institutions to manage forest resources/governance challenges

### **Biophysical design**

Forest inventory experts, contracted by the FAO, worked with the GoT to define a sampling design that would deliver estimates of selected forest parameters at the desired level of precision for each of the reporting units. The sampling design for measuring forest-related vegetation is a model-based design that uses the predicted spatial variability of total timber volumes (as a proxy for forest carbon) as the main parameter of interest. The resulting design consist of 3500 sampling clusters, most of which are located in forested areas (since these areas have higher variability of predicted timber volumes) (for details on the biophysical design, see Tomppo et al., 2010).

[Figure 2 about here]

NAFORMA's sampling design for collecting data through interviews follows the biophysical sampling design. The GoT decided to do so for two important reasons: First, it will allow for a close analytical link between biophysical and socioeconomic data, which in turn will strengthen the explanatory power and policy relevance of the data. And second, it will produce an unbiased sample of the population of interest: people living in or near forests. Figure 2 presents the map of Tanzania with the locations of the 3500 sampling clusters, and Figure 3 illustrates the relationship between the sampling units for the biophysical and interview data collection components. What is noteworthy about this design is that it seeks to produce representative data for key parameters at the district level (the lowest governmental unit in Tanzania) which will enable robust policy analysis of resulting data.

[Figure 3 about here]

## Interview design

In each two-kilometer circle, four households will be interviewed. Three more households will be selected as back-up households, in case field crews find that no one is home in one or more of the first four. These households will be identified and mapped out (as far as possible) before going to the field, using a combination of high-resolution imagery and key informants. The seven households are selected systematically in each sampling unit by selecting the households that are nearest the center of the two-kilometer circle. Figure 4 provides an example of such a selection process.

[Figure 4 about here]

Once a household has been identified, one interviewee should be selected systematically in each household. As a rule, both heads of households (head plus spouse) should be interviewed, if they are at home. Research has shown that household surveys produce biased results if only the male or female member is interviewed and NAFORMA wants to minimize such bias to the extent possible (Fischer et al., 2010). If no head of household is at home at any of the dwellings within the 2km sampling unit, the team leader will select two households for interviews in the nearest human settlement, as specified by the NAFORMA field manual (GoT and FAO, 2010). Preliminary calculation estimate that the total sample size of households interviewed will be within the range of 5,000-8,000 individuals, and a minimum. An estimated minimum sample size of 200 households in each district of interest will allow for meaningful quantitative statistical analysis of both biophysical and interview data at the sub-national level.

## Training and Field Tests

In January of 2010, a total of 150 field crews have been trained in the field application of data collection. The field protocols and field manual were field tested prior to the training, but participants in the training course provided additional suggestions for clarification of field protocols and the wording of interview questions. The household interview form went through eight revised iterations in total.

## Data collection, cleaning and processing

Data collection started in April of 2010. Initial results suggest that the time budgets for field work have held so far, with approximately 10 percent of the inventory completed. Household interviews take 45 minutes to complete on average, but about the same amount of time is required to locate the household to be interviewed. It takes one day of effective data collection for a fully staffed field crew of 8 individuals to complete one cluster's measurements and interviews. This time estimate does not include time required to request permission from local authorities and land owners to collect the data, and to get to the location of the cluster.

The choice of sampling design has implications for the generalizability of the interview data. NAFORMA's multi-stage stratified cluster design for biophysical measurements greatly enhances the efficiency of data collection, but it also creates some complications for the parameter estimation of interview data. The tightly coupled design makes it a bit more cumbersome (though far from impossible) to estimate population parameters for forest use that represent the entire Tanzanian population.

The reason for the complication is that the interview sampling design involves differential probabilities for the selection of interviewees. Consequently, each household in the sample does not necessarily represent the same number of households in the population at large, as would be the case if a simple random sampling approach were employed. This does not mean, however, that

estimating general population parameters is unfeasible, it is just a bit more time-consuming. To account for differential probabilities of selection and to ensure accurate survey estimates, sampling weights may be computed and applied to each observation of participating households. This is a standard survey analysis approach, which would be appropriate to use for the analysis of NAFORMA's interview component.

Using such sampling weights are common in surveys to compensate for over- or under-sampling of specific cases or for disproportionate stratification. To calculate such design weights, one uses the population census data to estimate the sampling fraction for each case and assign a weight that is the inverse of the sampling fraction. For example, in NAFORMA, we over-sample people living in or near forests. Comparing with the 2002 census data it is possible to calculate how much over-representation exists in our sample, which is possible to do since NAFORMA interview sampling design also includes some observations outside of forest areas, and even of some urban areas. If, by doing such a comparison, we found that we had oversampled rural households<sup>1</sup> at a rate of 2.13567 times greater than the rate of urban households, then the design weight for a rural household in NAFORMA would be  $1/2.13567$  and for an urban household respondent the weight would be 1.

Such weights may be used for producing descriptive statistics and proportions for the population at large. Precaution should be taken, however, when weighted data are used for producing inferential statistics, especially when estimating coefficients in multivariate regression models since the weights often increase the standard errors of estimates and can introduce instability in the data. Hence, when using interview data to test drivers of variation in biophysical characteristics in NAFORMA, it would be advisable to use un-weighted interview data.

### **Policy analysis and learning**

When the interview data is analyzed, it will be used to inform future policy decisions. Forest governance performance may be assessed, and policies could potentially be adjusted to mitigate failings and capitalize on successes. Social safeguards may be measured, including the equitability of benefit distribution, food security, and energy security of forest communities. When interview data is used to explain biophysical variation, the relative propensities of different regions for deforestation and forest degradation can be inventoried, and policies adjusted so that the allocation of funds is efficiently targeted to maximize benefits relative to costs.

The NFMA approach seeks to measure both forest governance indicators as well as the drivers of forest change at the local level. Measuring forest governance is important because it allows policy makers to assess the effectiveness of REDD+ projects, as well as national and regional forest policies in the interest of improving governance over time. Assessing the drivers of forest change in a comprehensive fashion is critical because knowing the relative propensities of areas to be deforested allows more efficient allocation of public funds to prevent deforestation in a more differentiated manner. Finally, understanding the microinstitutional and socioeconomic drivers of deforestation allows for more effective protection of social safeguards; collecting data on land use tenure, food security, energy security, and household income provides information on how household wellbeing is affected by REDD+ and other more domestic policy initiatives.

## **Criteria for Monitoring Forest Governance**

To analyze the extent to which the NFMA approach is able to deliver on its promise to provide forest policy-relevant, reliable and valid information to Tanzania's policy actors in a timely fashion, we apply three evaluative criteria. The first criterion is the degree of responsiveness to forest sector

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stakeholders' priority data needs. Responsiveness is critical because it lends legitimacy and relevance to the data. Collecting data according to the needs of stakeholders, including relevant decision makers, lends legitimacy to the approach in that data is more likely to inform policy if it is shaped according to policy needs. Other stakeholders, such as forest households, will benefit from the data if it is responsive to their needs as well. Policies that respond to local needs are more effective in generating equitable results (Korten 1984), and can facilitate useful adaptive management (Stankey et al. 2005).

The second criterion for a system of monitoring forest governance is feasibility of testing explanations of forest condition variability. While the causes of deforestation are complex, with local conditions acting to mediate underlying global and national level causes (Ostrom 2009; Liu et al. 2007), an improved understanding of the drivers of forest condition variability will permit more efficient policies. Given that some areas have greater propensity to be deforested and degraded than others, understanding forest condition variability at the sub-national level allows for policies to focus fiscal and human resources on areas more amenable to reductions in emissions from deforestation and forest degradation (Folke et al. 2002).

The third criterion is the extent to which common forest governance parameters are covered by the data collection. Good forest governance, defined as a decision making process that "allocates and manages resources efficiently, effectively and equitably," is necessary for desirable forest sector outcomes (World Bank 2009). A monitoring system that captures governance parameters to a comprehensive extent will be more effective at informing stakeholders of the performance and shortcomings of existing forest policies and suggest means of improvement. Beyond pursuing good governance as a goal in and of itself, measuring governance parameters may also help explain forest condition variability, the fourth criterion (Geist and Lambdin 2003; Andersson and Gibson, 2007; Agrawal and Chhatre, 2008; Ostrom, 2010).

The fourth criterion is the extent to which social safeguards for REDD+ are covered by the data collection. Social safeguards are policies that allow REDD to benefit forest communities in the developing world, or at least not harm them. Measuring the achievement of social safeguards requires data, including but not limited to on income, assets, employment, food security, energy security, health and education. Microinstitutional conditions like the stability of property rights and the enforceability of contracts are also important in assessing social safeguards (Chatam House, 2010; WRI, 2010; UNFCCC, 2009).

## Analysis

### Responsiveness to stakeholder needs

The NAFORMA questionnaires were designed to fill specific data gaps, which were identified through a preliminary stakeholder needs assessment. The process, which involved interviews by consultants of 52 individuals working in 17 different organization, is a good effort to try to systematically document the information needs among a broad spectrum of stakeholders. It is not apparent, however, how these stakeholders were selected and why others were not. For example, no local level stakeholders, such as local government representatives or private sector actors were consulted. It also appears that many of the actors interviewed were employees in the Forestry and Beekeeping Division of the central government. While this is an extremely important actor in the country's forestry sector, having this one particular actor so strongly represented in the needs assessment phase produces a bias towards central government interests and needs.

The stakeholders were also asked to propose explanations for forest condition variability. Their hypotheses provided substantive input into the formulation of interview questions on the household interview forms. In this way, NAFORMA's approach to meeting the second criterion (discussed below) was also shaped in response to stakeholder needs.

Our assessment is that NAFORMA was reasonably responsive to the selected stakeholder needs from its inception. Provided that the program will be able to continue to adapt to changing needs of relevant decision makers, it will be more likely to maintain legitimacy and remain relevant. Providing information that is relevant to decision making can facilitate adaptive management, as decision makers shape policies in response to empirical findings from data analysis, and continually identify relevant data gaps.

### **Feasibility of testing explanations of forest condition variability**

For deforestation drivers, we used two well-known frameworks: Geist and Lambdin (2003) and Kaimowitz and Angelsen (1999) to define the main groups of variables of interest. We summarized their proposed sets of deforestation drivers into five main groups of variables: (a) forest use; (b) socio-economic conditions and values; (c) forest governance; (d) macro-economic and market conditions, and (e) biophysical conditions. For each of these categories, several more specific causal parameters were identified – an identification process that was informed by the NAFORMA stakeholder consultations.

Table 2 presents the summary of the analysis of the NAFORMA field interview instruments and the degree to which these capture 15 types of deforestation drivers, which—according to NAFORMA stakeholder consultations—represent common causal factors in the Tanzanian context. The 15 potential causal factors are in turn grouped into five main categories of drivers (column 1). The ensuing analysis reveals that some of these categories are better covered than others, but there are few gaping holes.

[Table 1 about here]

On the positive side, NFMA is highly effective in capturing the main categories of drivers of deforestation, derived from Geist and Lambdin (2002) and Kaimowitz and Angelsen (1999). Forest use characteristics, user conditions, and relevant forest governance parameters are all directly captured through NFMA. One of the weaknesses of the NFMA approach is its lack of coverage when it comes to macroeconomic conditions. These conditions, which are important drivers of deforestation, are not explicitly assessed with NFMA. That said, it is possible to obtain the most important pieces of information on these factors – such as the price of timber, the price of agricultural commodities, or the price of electricity - from currently existing data sources. Also, biophysical conditions--including soil type, degree of forest cover, topography and ecotype--are data that are not collected through interviews but are assessed in the biophysical inventory associated with NFMA.

### **Coverage of common forest governance parameters**

To select appropriate categories of forest governance parameters, we used the World Bank's analytical framework as the basic reference (Kishor et al, 2010). This framework identifies five comprehensive groups of parameters related to forest governance: (a) Transparency, Accountability and Public Participation; (b) Stability and reliability of forest institutions and conflict management; (c) Quality of forest administration; (d) Coherence of legislation, rule of law, rules-in-use, enforcement, and (e) Economic efficiency, equity and incentives. The framework also identified several more specific sub categories for each of these five broad categories, making a total of 32 subcategories of forest governance parameters of potential interest.

The main reasons for selecting this particular framework is that it is broad and inclusive in its conceptualization of governance, more so than most of the other recently proposed frameworks, including frameworks developed in WRI (2009), Chatham House (2010), UNDP (2010), CIFOR (1999), ITTO (2005), and Mayers et al.(2002). These other frameworks are more narrowly focused on particular aspects of forest governance, such as the sustainable forest management indicators or social safeguards for REDD+. Because the World Bank framework is more comprehensive than other frameworks it provides a more robust framing for assessing the existing NAFORMA monitoring system, especially when it comes to examining the extent to which this system captures diverse forest governance aspects.

Table 2 presents the results of the review of the NAFORMA field interview instruments in light of the demand to monitoring forest governance, broadly construed. The table includes a qualitative assessment of the degree to which the NAFORMA field interview instruments capture the emerging needs for the five broad aspects of forest governance, and 32 sub-categories of forest governance parameters. The qualitative scores range from non-existent to strong. This analysis shows that more serious data gaps exist for this expected output. About a third of the 25 subcategories of forest governance are assessed as either weak or non-existent.

[Table 2 about here]

The NFMA approach performs adequately in 17 of the 32 (53%) World Bank governance parameters. The main data gaps are related to the quality of forest governance at the national level. For example the NAFORMA field interviews do not assess the characteristics of the decision making process at the national level of government, such as the degree of transparency within the forestry administrative offices or accountability between forestry agencies in the country. The subcategories in which NAFORMA seems to have a comparative advantage is in the measurement of de-facto property rights arrangements, informal institutions, household characteristics, forest product use, local people's attitudes towards forest conservation, and de facto relationship with governance actors external to local forest user communities.

The main data gaps in the current NFMA approach seem related to assessing the quality of forest governance at the national level. For example the NAFORMA field interviews do not assess the characteristics of the decision making process at the national level of government, such as the degree of transparency within the forestry administrative offices or accountability between forestry agencies in the country. The subcategories in which NAFORMA seems to have a comparative advantage is in the field measurements of de-facto property rights arrangements, informal institutions, household characteristics, forest product use, local people's attitudes towards forest conservation, and de facto relationship with governance actors external to local forest user communities.

### **Coverage of social safeguards**

We assess NAFORMA vis-à-vis the Copenhagen Accord's seven specific social safeguards that signatory countries are committed to ensure in the context of REDD+ transactions. These seven safeguards as outlined by UNFCCC (2009) are: (a) Consistency with national forest programs, international conventions and agreements; (b) Transparent... national forest governance structures; (c) Respect for indigenous people and local communities' rights; (d) Full and effective participation of relevant stakeholders; (e) Consistency with conservation of natural forests and biodiversity; (f) Address risk of reversals, and (g) Address risk of displacement. The effectiveness of NAFORMA in assessing these social safeguards is analyzed in Table 3.

[Table 3 about here]

NFMA assesses, to some degree, four of the seven social safeguards posited by the UNFCCC. As with governance, its weaknesses are in areas of national level governance. Consistency with national forest programs is not addressed at all, while the transparency of national forest governance structures is only addressed peripherally by surveying household knowledge of legislation and attitudes. The risk of reversal is not assessed, but reversal itself is monitored. On the other hand, NAFORMA is relatively strong in its position to field monitor respect for indigenous communities and local communities' rights, and consistency with conservation of natural forests and biodiversity. It performs moderately well in assessing stakeholder participation and the risk of displacement.

## Discussion

Given that a large portion of global CO<sub>2</sub> emissions come from changes in land use including deforestation and forest degradation--about 17 percent according to IPCC's 4th assessment report (IPCC, 2007)--any effective strategy for climate change mitigation must address these issues. REDD+ stands to generate tremendous benefits if it is implemented successfully, with emissions reductions that are additional, robust to leakage, and permanent. Moreover, REDD+ has the potential to generate important co-benefits and work with, rather than against, international development goals if it is implemented properly. Because payments for ecosystem services are a core component of REDD+, a robust system for monitoring, reporting and verification is an inextricable component of the policy. Without extremely well-functioning systems for monitoring carbon stocks, REDD+ cannot succeed, because payments for ecosystem services cannot be made efficiently. Further, the effectiveness of REDD+ will be compromised without robust, internationally coordinated monitoring, because leakage will be uncontrolled.

However, while monitoring carbon stocks is necessary for REDD+ to function, it is not sufficient. Success of REDD+ needs to be gauged also in terms of the degree to which observable outcomes are effective, efficient, and equitable. The generation of co-benefits, including biodiversity protection, sustainable forest management, and the respect of indigenous and local communities, are now even formally recognized as appropriated metrics for the success of REDD+ (UNFCCC, 2009). Without monitoring forest governance from a more holistic perspective--which includes property rights, economic conditions, quality, transparency and coherence of policies--the effectiveness of policies cannot be assessed adequately. When policies cannot be adequately assessed, the degree to which emissions reductions represent additionality over business-as-usual will remain ambiguous, and the effectiveness of the policies will be uncertain.

While the exact causes of forest change are not thoroughly understood, collecting data on these drivers through an approach such as NFMA will lead to an improved understanding of forest condition variability, and an improved ability to predict circumstances under which deforestation and forest degradation are more and less likely to occur. This understanding is essential for producing efficient policies, in which resources are targeted towards areas that are most amenable for reductions in deforestation and forest degradation at the lowest cost. In other words, a monitoring system that facilitates learning about the drivers of deforestation will lead to an increasing capacity to identify the smartest intervention strategies.

Finally, monitoring carbon stocks alone tells us nothing about whether benefits from payments for ecosystem services exist and the extent to which these are being distributed equitably. Only a monitoring system that focuses on governance issues, including the transparency and accountability of policies, as well as the actual distribution of payments to households on the ground, can reveal this important information.

NFMA represents an important departure from REDD+ monitoring systems that focus on carbon stocks alone. The twin purposes of NFMA are to directly monitor the governance of REDD+, and simultaneously reveal critical information about the underlying and proximate drivers of deforestation, so that the extent to which REDD+ is meeting the three criteria of outcome success may be gauged so that the governance of REDD+ can be improved over time.

Needless to say, NFMA is not universally successful in revealing parameters relevant to forest governance. It seems like a productive approach when it comes to assessing certain types of parameters on the ground--such as property rights, land tenure, household economic characteristics, and public participation in forest governance. Where NFMA has shortcomings-- as appears to be the case for its assessment of the quality of forest governance at the national level, macroeconomic conditions, and transparency and accountability within the forestry sector--there may be opportunities to supplement NFMA data collection efforts with other sources of information, as well as adding illuminating interview questions on currently overlooked issues.

## Conclusion

The NFMA's field-based approach to assessing and monitoring forest governance provides added value to existing approaches to the study of forest governance. It makes a methodological contribution in that it actively seeks synergies with the biophysical field measurements. By coupling the biophysical and interview components of the NFMA in this manner, analytical leverage is improved for both components' data. It also makes a substantive contribution in that the interview data allows for the systematic testing of causal processes (as specified by stakeholders during the needs assessment stage of the NFMA process) related to forest condition variability at the national and sub-national level of a country, such as Tanzania.

These contributions make the NFMA approach to forest governance monitoring a relatively effective monitoring approach for REDD+, with a comprehensive focus on forest governance and the drivers of forest change. In aiming to assess both of these important issues, NFMA accomplishes its two purposes. First, policy relevant information on human-environment interactions is provided, so that decision makers can use the results of monitoring to not only understand the effectiveness of policies, but also improve them over time to fit local conditions more effectively. The effectiveness of REDD+ can be thusly evaluated, and improved in the face of challenges such as leakage and permanence. Doing this without biophysical and interview data from the field seems unfeasible and unreliable. Second, the drivers of deforestation will be increasingly well understood through analysis of data that NFMA provides. This will allow the degree to which different regions are likely to experience deforestation and forest degradation to be examined, and for policies that target areas that are most amenable to intervention – the low hanging fruits of REDD+.

Further research should take into account the importance of assessing both forest governance and the underlying drivers of deforestation for REDD+ monitoring systems. The NFMA approach ought to be seen as an important departure from monitoring systems that focus on either carbon stocks OR national governance processes in isolation of one another. Researchers and policy makers should direct their efforts to improving the ability of monitoring systems to capture these important human-environment interactions, so that policies can be adapted to local conditions and the tremendous potential benefits of REDD+ have the best chance of being realized.

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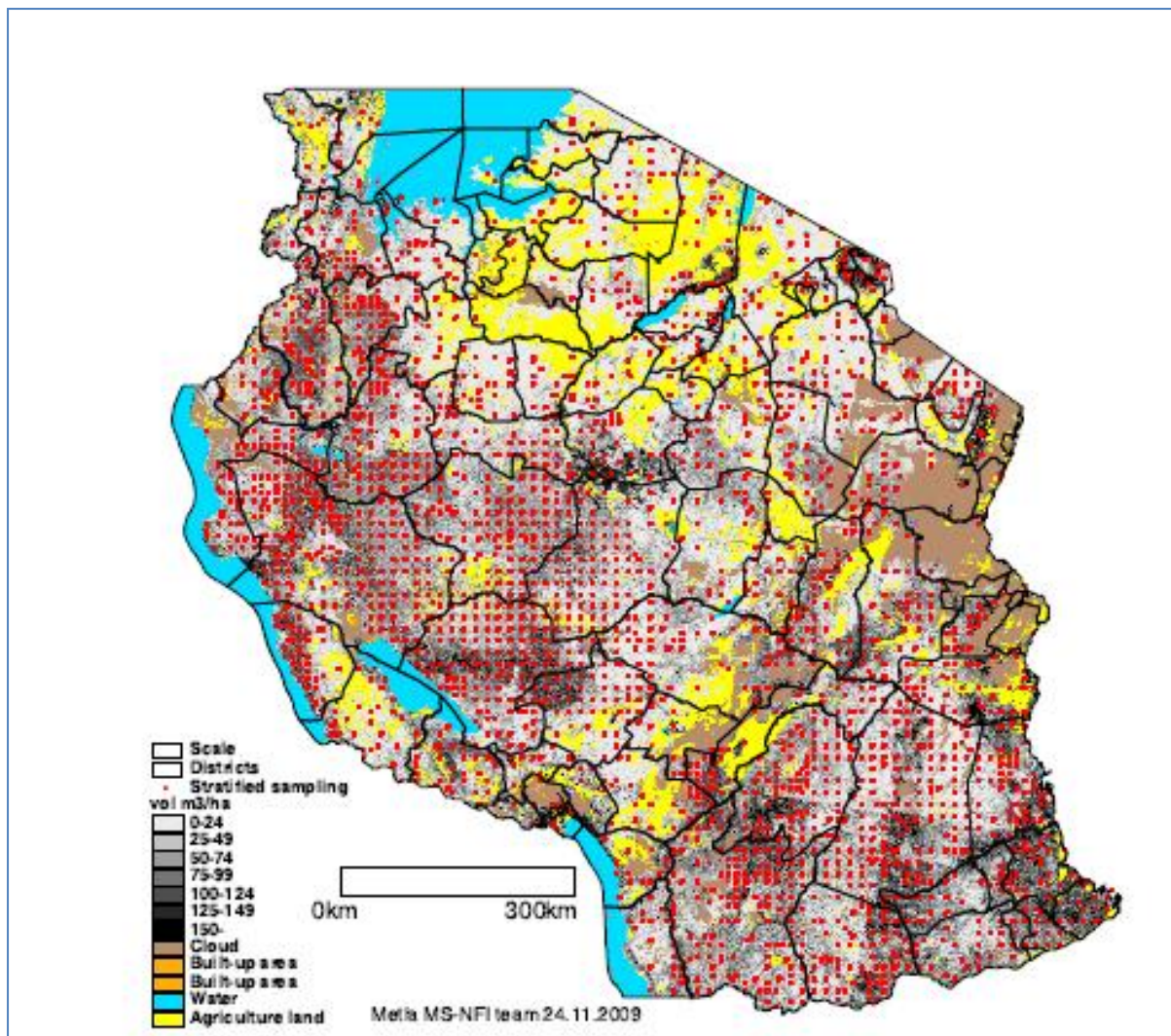
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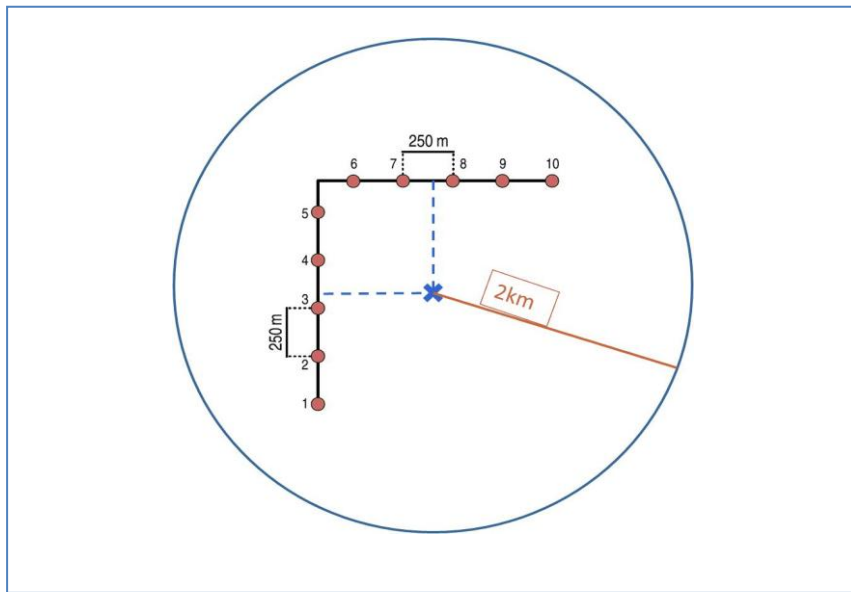
UNFCCC (2009)



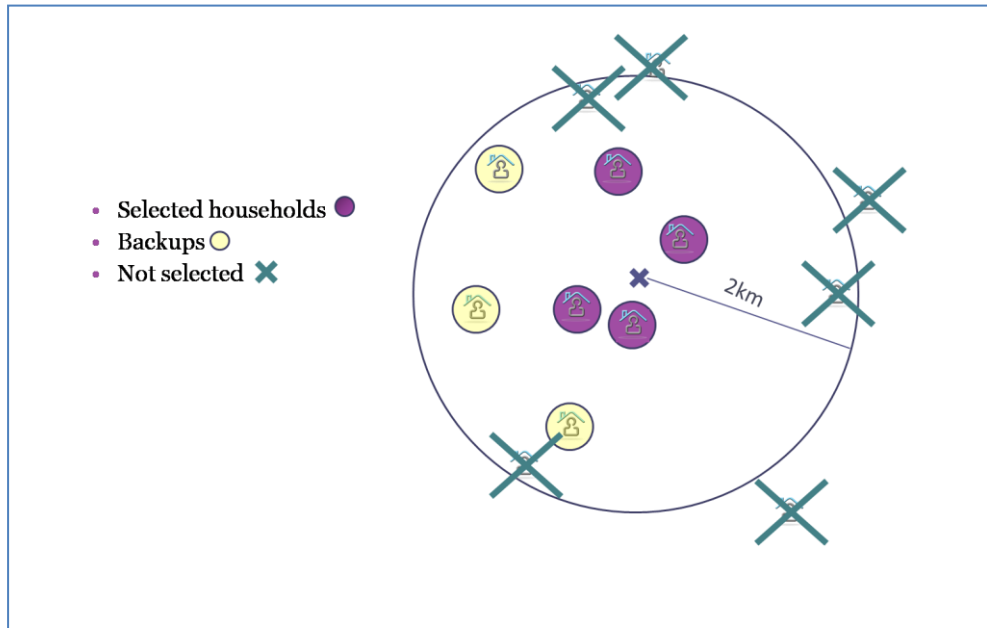
**Figure 1: NAFORMA and Forest Policy Making Process (based on GoT and FAO, 2010)**



**Figure 2: Tanzania NAFORMA sampling design: the location of the sampled field clusters (from Tomppo et al., 2010)**



**Figure 3. Relationship between Biophysical and Interview components (from Kessy and Andersson, 2010)**



**Figure 4: Household selection procedure (from Kessy and Andersson, 2010)**

**Table 1: Monitoring Human Causes of Forest Change**

<i>Drivers</i>	<i>Parameter of Interest</i>	<i>NFMA Field Indicator</i>	<i>Field Form (#) Questions</i>
<b>Forest use</b>	Magnitude of use	a. Number of households living near forest and over-time changes. b distances from HH to forest, and c. quantities of products harvested by HH	KI-5, 11; HH-B3,H1
	Type of use	a. Domestic vs commercial use, b. salience of forest to household livelihood	HH-H1, HH-E3,
	Alternative land uses	Agriculture, grazing, water	HH-H3
	Salience of forestry	a. coping strategies related to forest use, b. importance of forestry vs other land uses	HH-E8, F1
<b>Socio-economic values and conditions</b>	Household characteristics	a. Household income level; b. Income sources; c. HH vulnerability	HH-F1, E5-8, KI-4
	Education	Years of schooling	HH-C10
	Asset level and equality	a. Household assets, b. land ownership. c. inequality of asset distribution, d. local infrastructure development	HH-D1-2, 4-7, KI-9
	Vulnerability	Household food security	HH-E1-2
		Household energy source, usage, and alternatives	HH-D3
	Values	Attitudes towards forest conservation actions and government actions	HH- G1-2
<b>Forest governance</b>	Community governance	Awareness of PFM	HH-I1
		Local rule making, local monitoring, prevalence of conflicts	HH-I6, H1, KI-7-8
		HH involvement in management	HH-I3, KI-13-18
	Governmental involvement	Frequency of government monitoring, number of arrests, likelihood of being caught	HH-I7-9, KI-20-21
		Interaction between government and community, which external organization is most important to locals, how accessible is it?	HH-J, KI 23-24
		Perceived equity of law and enforcement activities, awareness of laws, degree of enforcement	HH-G3-4, H1
		Property rights	Length of land tenure; land use rights; management rights, conflicts
Incentives	Payments for ES, amount, rank, private utility (rank), organizational benefits	HH-H2, HH-15	
<b>Macro-economic and market conditions</b>	Price of agricultural commodities; distance to markets; price of electricity	Not addressed in NFMA per se, but to a large extent available through existing sources.	KI-9
<b>Biophysical conditions</b>	Soil quality; drought frequency; ecosystem, topography	Addressed in NFMA’s biophysical inventory component	Cluster- and plot-level forms

**Table 2: Monitoring Forest Governance in NAFORMA**

Governance Issues	Parameters	NFMA Field Indicators	Field form question #	Qualitative Assessment	Potential Additions
<b>Transparency, Accountability and Public Participation</b>	Transparency in forest sector	Not addressed by NFMA	N/A	Non-existent	1. Perceptions by users (HH), 2. availability of forestry data and documentation (NW)
	Decentralization, devolution, and public participation	(a) HH involvement in PFM or other initiatives; (b) benefits from management; (c) monitoring activity; (d) interactions with external organizations; (e) locus of decisions	HH-I1, 2, 3, 5, 6, 9; J1; KI 13-16	Strong	1. Opportunities for self-governance (KI, NW); 2. Extent of consultations for budgeting, planning (HH); 3. Degree of funded mandates (KI, NW)
	Accountability of forestry officials	(a) HH interaction with forest governance organizations; (b) field presence	HH-I7, J1	Weak	1. demands and responses from different levels of government (expand HH-J; NW)
	Accountability within forestry agencies	Not addressed by NFMA	N/A	Non-existent	1. clarity of goals, strategy, and responsibilities 2. Checks/balances (NW)

Governance Issues	Parameters	NFMA Field Indicators	Field form question #	Qualitative Assessment	Potential Additions
<b>Stability and reliability of forest institutions and conflict management</b>	Stability of forest institutions	Not addressed by NFMA so far	N/A	Non-existent	1. turnover rates in national organizations (NW) and in the field-based org's (KI); 2. Consistency in government actions (KI,).
	Reliability and stability of tenure rights	(a) outsiders' respect of private and communal property; (b) over-time changes in residence time; (c) change in forestland area; (d) changes in property rights; (e) forest use trends	HH-C8;D4; H3 KI-10-11	Strong	1. Quality of cadastre and property right records (NW); 2. perceptions of changes in security of property rights (HH)
	Management of conflicts in forestry sector	(a) prevalence of user conflicts (b) degree of local compliance to property boundaries; (c) who decides sanctions	HH-H1; D4.	Fair	1. Access to external organizations (HH); 2. Forums for conflict management (KI, HH) 3. Quality of governmental adjudication and mediation/settlements (NW)

HH= Household Interviews

KI=Key Informant Interviews

NW=National Workshop

Governance Issues	Parameters	NFMA Field Indicators	Field form question #	Qualitative Assessment	Potential Additions
<b>Quality of forest administration</b>	Willingness to address forest sector issues	Not addressed by NFMA so far	N/A	Non-existent	1. stakeholder perceptions of (a) government commitment to good governance practices; (b) Checks, balances, and separation of powers (NW)
	Capacity and effectiveness	(a) Monitoring and enforcement activities; (b) detection capacity; (c) field presence; (d) level of illegality; (e) awareness of legislation; (f) User perceptions about detection probability; (g) perception of government effectiveness	KI-19, HH-H1; I6-9;	Fair	1. User confidence in forestry agencies (HH); 2. Human and Infrastructure capital (NW); 3. Quality of information about forestry sector activities, problems (NW)
	Corruption Control	Not addressed in NFMA	N/A	Non-existent	1. Local and national perceptions of corruption in government (HH, KI, NW); 2. Accounting system for forestry revenues national and regional levels (KI, NW)
	Forest Monitoring and Enforcement	(a) Monitoring and enforcement activities; (b) detection capacity; (c) field presence; (d) level of illegality; (e) awareness of legislation; (f) User perceptions about detection probability	KI-19, HH-H1; I6-9;	Fair	1. Data for analysis (NW); 2. Analysis for learning (NW); 3. Forum for policy learning (e.g. NFP) (NW);

Governance Issues	Parameters	NFMA Field Indicators	Field form question #	Qualitative Assessment	Potential Additions
<b>Coherence of legislation, rule of law, rules-in-use, enforcement</b>	Quality of domestic forest legislation	(a) awareness of legislation; enforcement and PFM (b) fairness of rules and punishments (c) payments for ES; (d) detection likelihood (g) government leadership (h) multilevel governance	HH-H1, G3-4; KI-19, 24	Fair	1. Opportunities for participation in forest management and decision-making (NW, KI); 2. perceptions of transactions costs for forest management (NW, KI); 3. Formal/ informal rule fit, congruence (HH)
	Quality of civil law implementation	(a) origin of rules-in-use; (b) legislation awareness	KI 7-8	Weak	1. Forestry and non-forestry laws applied? 2. Reasons laws are not implemented (NW)
	Support to self-governance of forests	(a) HH access to forums for conflict resolution; (b) technical support; (c) enforcement back-up	HH-J1, I1,2,7-9; KI-13-16,	Fair	1. access to conflict management forums (HH, KI); 2. Enforcement back-up (KI); 3. accessibility of technical assistance (HH)
	Rules-in-use	(a) restriction of use (b) monitoring and enforcement (d) management plan	KI-17-18, HH-I	Strong	1. Degree of local adaptation; 2. Contradictions with government rules (KI)
	Quality of criminal forest law	(a) sanctions; (b) monitoring and enforcement; (c) sanctions/prosecution	KI-19-21;	Fair	1. consistency and credibility of sanction system (KI, HH).
	Quality of forest adjudication	Not addressed by NFMA	N/A	Non-existent	1. Stakeholders' access, affordability to courts and arbitrators (NW); 2. Degrees of enforcement of decisions (NW)
	Property rights recognized, honored and enforced	(a) outsiders' respect of property; (b) changes in (i) residence time; (ii) forestland; (iii) property rights; (iv) forest use	HH-C8;D4; H3 KI-10-11	Strong	1. Quality of property right records (NW); 2. Changes in security of property (HH); 3. Discrepancy between formal and informal property rights; 4. Contracts enforced (KI)

Governance Issues	Parameters	NFMA Field Indicators	Field form question #	Qualitative Assessment	Potential Additions
<b>Economic efficiency, equity, and incentives</b>	Property rights recognized, honored and enforced	(a) outsiders' respect of private and communal property; (b) over-time changes in residence time; (c) change in forestland area; (d) changes in property rights; (e) forest use trends	HH-C8;D4; H3 KI-10-11	Strong	1. Quality of cadastre and property right records (NW); 2. perceptions of changes in security of property rights (HH); 3. Discrepancy between formal and informal property rights; 4. Contracts enforced (KI)
	Maintenance of ecosystem integrity	(a) strength of local people's conservation efforts; (b) benefits from forest management; (c) change in (i) income from forests; (ii) distance from product source; (iii) conflicts	Forest mensuration data, HH-G2-3; H1	Fair	1. Safeguards for sustainability (NW); 2. Systematic analysis, discussion, and publication of monitoring results (NW)
	Incentives for sustainable use	(a) PES; (b) local rules; (c) local monitoring and enforcement (d) local conservation values; (e) central enforcement activity; (f) detection probability (g) PFM/other initiatives	KI-7-8, 20-21; HH-H1, I,	Strong	1. Volume of payments at national level (NBS/FBD); 2. REDD payments made; 3. Conservation funding paid to NGOs, local forestry offices, park ranges; 4. Income from ecotourism (change)
	Forest product pricing	Not covered by NFMA	N/A	Non-existent	1. Stakeholder perceptions on price distortions in the sector (NW); 2. Existence of (anti) forest subsidies (NBS);
	Commercial timber trade and forest business	Non covered by the NFMA	N/A	Non-existent	1. Transparency of the permit process; 2. Allocation by auctions, competitive procurements; 3. Export record verification; 4. Trade support systems in place (NBS, NW).
	Equitable allocation of forest benefits	(a) fairness of rules; (b) fairness of punishment (c) change of forest-related income; (d) change in number of HH with commercial end use	HH-G3-4; HH-H1	Fair	1. Distribution of forest management benefits (HH); 2. Change in land tenure distributions; 3. Area under PFM (NW/FBD)
	Market Institutions	(a) Area under forest management plans (b) Area under PFM	Cluster and plot-level measurement	Weak	1. market share in world timber and carbon markets, ; 2. Forestry GDP; 3. Stakeholder perception of competitiveness of forestry sector. (NW)
	Forest revenues and expenditures	Not covered by NFMA	N/A	Non-existent	1. Stakeholder perceptions of: (a) revenue collection system and (b) expenditure systems (NW)
Household Characteristics	(a) income (b) assets (c) food security (d) energy; (e) residence; (f) income from forests, and (g) changes in AOTA.	HH-F1;HH-D2;HH-E1;HH-D1&HH-D2	Strong	1. national HH income and expenditure indicators (NBS); (2)	

**Table 3: NAFORMA and the UNFCCC Social Safeguards**

<i>REDD+ Social Safeguards</i>	<i>NFMA Indicators</i>	<i>Form Questions</i>	<i>Assessment</i>
<b>1) Consistency with national forest programs, international conventions and agreements.</b>	none		Non-existent
<b>2) Transparent... national forest governance structures</b>	(a) knowledge of legislation (b) attitude: fairness of rules and punishments (c)	HH-H1-2, G3-4; KI-19, 24	Weak
<b>3) Respect for indigenous people and local communities' rights</b>	(a) outsiders' respect of individual and common property; (b) changes in access to (i) forestland; (ii) property rights; (iii) forest products (iv) commercial end use	HH-D4; H1; H3 KI-10-11	Strong
<b>4) Full and effective participation of relevant stakeholders</b>	(a) HH interaction with governance orgs; (b) HH participation in monitoring; (c) freq of own monitoring; (d) who decides	HH-I3-7, J1	Fair
<b>5) Consistency with conservation of natural forests and biodiversity etc</b>	(a) estimates of forest parameter change (b) HH receives PES (c) HH receives subsidies for other LUs; (d) restrictions on use; (e) origin of rules; (f) change of forest-related HH income; (g) change in HH with commercial end use	BP , HH-F1, H1-2, J1, KI7-8	Strong
<b>6) Address risk of reversals</b>	(a) existence of reversals	BP, HH-H3, HH	Weak
<b>7) Address risk of displacement</b>	(a) changes in location of harvesting; (b) physical displacement of households (c) changes in effective user restrictions on the ground (d) Scaled-up deforestation rates	BP, KI, HH-B, C,	Fair

## **Governance Parameters (using WB, CH, UNFCCC frameworks)**

The NFMA approach is generally effective at capturing governance parameters. Where there are shortcomings, there are often low-cost improvements that can be made that would make the system even more effective

### *Transparency, Accountability and Public Participation*

The effectiveness of the NFMA approach in obtaining information concerning transparency, accountability and public participation is varied. Public participation is directly assessed, with households reporting their involvement in forest governance. The degree to which forest officials are held accountable is addressed less directly, with households only reporting on the frequency of forest officials' visits. There is considerable room for NFMA to assess accountability more adequately, by asking households about their ability to hold forest officials accountable, and feed back into the governance process. Transparency and accountability within the forest sector are not addressed by NFMA. This shortcoming can be overcome through two mechanisms. First, households may be asked for their perceptions concerning the transparency of policies. Second, the availability of public records and documents can be assessed, with key informants from the forestry sector being asked to report on accountability within the sector. Assessment of transparency, accountability and public participation can be thusly enhanced with supplemental information from public records, along with more pointed questions in the household surveys and key informant interviews.

### *Stability and Reliability of Forest Institutions and Conflict Management*

The NFMA approach is fairly strong in assessing the stability and reliability of forest institutions, and conflict management. The reliability and stability of land tenure rights is particularly well covered. Households report on the length and type of tenure they have over forest land, and key informants provide information on the longer term trends in land tenure changes in the sampling areas. Changes in property rights and changes in forest use type are both assessed through NFMA. Conflict management is assessed as well, with households reporting on conflicts among forest users and the actors responsible for enforcing sanctions. Further information on conflict management may be obtained by supplementing NFMA with existing public records, while also asking key informants and households to delineate available for a for adjudicating conflicts. While the stability of forest institutions is not yet addressed by NFMA, supplemental data on government turnover, along with additional questions for key informants elucidating the consistency of government action in forest policy, can provide important insights.

### *Quality of Forest Administration*

The performance of NFMA in assessing quality of forest administration is fair. Capacity and effectiveness, as well as forest monitoring enforcement, are assessed to some extent through both household and key informant interviews. For both, supplemental data from government sources would be very useful in ascertaining the types of institutions working in forest management, and the extent and success of forest monitoring enforcement, respectively. Households may also be surveyed for their confidence in government institutions to assess the effectiveness of forest administration. Neither the willingness of the government to address forest sector issues, nor corruption in the forest sector are directly assessed through NFMA. Governmental willingness to address forest issues may be assessed via proxy by surveying household perceptions of the government's commitment. Corruption is inherently difficult to assess, but surveying households directly for their perceptions of corruption, supplemented with international corruption indices both serve as useful approximations.

### *Coherence of Legislation, Rule-of-law, Rules-in-use, Enforcement*

The effectiveness of the NFMA approach in obtaining information concerning coherence of legislation, rule-of-law, rules-in-use, and enforcement is varied. Household surveys and key informant interviews are very effective sources of information for assessing rules-in-use, with explicit data collection on use restrictions, monitoring and enforcement. Households are also thoroughly questioned on land tenure changes, and the security of forest property rights. The quality of domestic legislation, support for self-government, and criminal enforcement is addressed somewhat indirectly, by assessing households' awareness of laws, access to forums for technical support and conflict resolution, and the type of sanctions that are available, respectively. The quality of forest adjudication is not directly addressed. This area can be supplemented with data concerning the affordability and degree of access to courts that stakeholders have.

### *Economic Efficiency, Equity and Incentives*

Economic efficiency, equity and incentives are well captured by NFMA. In general, the gaps in NFMA data can be easily supplemented by available data and additional interview questions. NFMA performs especially well in assessing the type and stability of property rights held by households. The approach is also very effective in ascertaining household characteristics such as income, assets, food security, and energy usage. Incentives for sustainable use are directly assessed through household and key informant interviews, both in relation to existing payments for ecosystem services as well as REDD+ payments. NFMA is fairly effective in assessing community efforts to maintain ecosystem integrity, along with the degree to which forest system benefits are distributed equitably. Household surveys provide most of this information, and it may be supplemented with existing data on government programs for ecosystem conservation and mechanisms for payments for ecosystem services. While the NFMA approach does not assess macroeconomic conditions such as the price of timber products, and costs associated with the forestry sector, central reports from relevant actors and public records will be very effective supplements in these areas.