COMMUNITY MONITORING, REPORTING AND VERIFICATION FOR REDD+

Lessons and experiences from a pilot project in Guyana.

GCP
GLOBAL CANOPY PROGRAMME

IWOKRAMA

The CREW. Credit: Andrew Mitchell

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EXECUTIVE SUMMARY

This report provides a comprehensive overview of the Community Monitoring, Reporting and Verification (CMRV) project in the North Rupununi, Guyana, funded by the Norwegian Agency for Development Cooperation (NORAD).

It presents the approach and steps taken in setting up and managing the first phase of this pilot project (2011-2013), as well as some of the key lessons learned, recommendations, and challenges.

The aim of the first phase of the project was to pioneer an approach through which communities could monitor their forests, and also possibly receive payments or other benefits through a REDD+ opt-in mechanism being developed by the Government of Guyana. At the time of publication of this report, the project was in its second phase, under the wider Forest COMPASS: Community-powered Assessment of Ecosystem Services and Safeguards project. In this phase, in addition to continuing the work in Guyana, we are we are working with local partners in Acre, Brazil, to replicate the project in the Chico Mendes Reserve. We are also seeking to build a network of practitioners of community-based monitoring to share knowledge and best-practice and to further advocate for community-based monitoring as a viable approach for maximising REDD+[2] effectiveness, efficacy and equity. This phase of the project operates at the local, national and international levels.

This initiative has involved collaboration between a team of 32 dedicated community monitors from 16 indigenous Makushi villages, five local project management staff, and partner representatives from the Global Canopy Programme (GCP), the North Rupununi District Development Board (NRDDB) and the Iwokrama International Centre for Rainforest Conservation and Development (IIC), with wider cooperation with the Government of Guyana through the Guyana Forestry Commission (GFC).

Data has been gathered on wellbeing, natural resource use, land-use change and carbon stocks, in order to generate information that can inform local resource management, and inform the development of national forest monitoring and safeguard information systems as part of Guyana's Low Carbon Development Strategy (LCDS). Beyond this, it is hoped that the results of this project move discussions on REDD+ and indigenous participation forward at the national and international levels.

The experiences gained and lessons learned during phase 1, documented in this report, will be fundamental to further testing, improving and advocating for community participation in REDD+, as well as other national and international initiatives on forests, such as FLEGT VPAs[3] and NBSAPs[4]. The authors ultimately hope that this report can serve as a valuable case study of community-based monitoring.

Key lessons and recommendations

Community-based monitoring has an important role to play in improving local resource management and informing the implementation of REDD+ regimes with local participation, as well as the potential to provide employment and income for local communities. Yet there are important considerations that stem from adopting such a model:

1. Monitoring activities must take into account multi-stakeholder interests and balance out external and local priorities and data needs in order to achieve relevance and integration of data at different scales;

2. Local institutions must be embedded in the governance and decision-making of the monitoring project to guarantee community participation and ownership, and to improve engagement with external entities;

[1]The project was originally called Community empowerment for forest measuring , reporting and verification (CMRV) in the proposal to Norad. 'Measuring' later became 'monitoring' due to the latter being used more widely in Guyana.

[2]Reducing Emissions from Deforestation and Forest Degradation plus the role of conservation, sustainable management of forests and the enhancement of forest carbon stocks.

[3]Voluntary Partnership Agreements under the EU's Forest Law Enforcement, Governance and Trade (FLEGT) Action Plan – see www.euflegt.efi.int/home.

[4]National Biodiversity Strategies and Action Plans under the Convention on Biological Diversity (CBD). See www.cbd.int/nbsap.

3. Local participation is fundamental in data management in order to guarantee transparency when establishing a data sharing protocol; such a protocol takes time and should be reviewed regularly following the principles of Free, Prior and Informed Consent (FPIC) and respecting data ownership;

4. Monitoring systems should feed directly into existing management plans and development strategies in order to establish appropriate interventions; therefore the design of effective methodologies must consider how the outputs will be processed, reported and applied so that the resulting information is relevant and useful;

5. Regular outreach and communication activities are essential to establish support and understanding among the wider community, who may not be participating in and benefiting directly from the project;

6. When community members are adequately trained and informed, they can produce data of national relevance;

7. Communities are best placed to gather socio-environmental baseline data for national safeguard information systems;

8. Monitoring systems relying on technology must consider the trade-offs involved and prioritise technical training;

9. Community participation in monitoring must be considered as a service, in order to guarantee permanence and continuity of the work, and therefore the sustainability of monitoring systems is strongly linked to long-term funding streams;

10. Some standardisation of methodologies and protocols on data collection and reporting is needed in order to achieve scale, keeping in mind, at the same time, the different aims of different projects.

In addition, an unexpected finding was that mobile phones encouraged intergenerational exchange, with the younger generation teaching the older generation to use the phones, while the older generation shared the necessary knowledge on farming and biodiversity needed for the surveys.

Main outputs of the project

Through the efforts described in this report, the CMRV project in Guyana delivered the following key outputs:

1. Sixteen community resource maps and reports were produced.

2. The main drivers of deforestation in the monitoring region were identified.

3. Government satellite data was ground-truthed.

4. A report on above-ground biomass in the monitoring region was produced.

5. A set of indicators for assessing natural resources and community wellbeing were agreed upon among and monitored by key project stakeholders.

6. Capacity was built among local project team members to collect, process and analyse forest monitoring data.

7. A briefing note for the Government on Free, Prior and Informed Consent, in the context of CMRV, was produced.

8. A CMRV data sharing protocol was initiated.

The detailed maps, reports, and data gathered were provided in reports to stakeholders. Information that the communities have agreed to share with wider audiences will be presented in subsequent reports, as will the further developments and results of phase 2 of the project.

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ACRONYMS AND ABBREVIATIONS

CREW	Community Resource Environment Worker
CBFM	Community-based forest management
CBM	Community-based monitoring
CDS	Community Demonstration Site
CMRV	Community Monitoring, Reporting and Verification
FPIC	Free, prior and informed consent
GCP	Global Canopy Programme
GFC	Guyana Forestry Commission
GIS	Geographic information systems
GPS	Global Positioning System
HFLD	High forest low deforestation
ICC	Iwokrama International Centre for Rainforest Conservation and Development
LCDS	Low Carbon Development Strategy
MAA	Ministry of Amerindian Affairs
MoU	Memorandum of Understanding
MoC	Memorandum of Cooperation
MRV	Measuring, reporting and verification
MRVS	Monitoring, Reporting and Verification System
MRU	Makushi Research Unit
NRDDB	North Rupununi District Development Board
NORAD	Norwegian Agency for Development Cooperation
NTC	National Toshaos Council
NTFP	Non-timber forest product
OCC	Office of Climate Change
ODK	Open Data Kit
PMT	Project management team
REDD+	Reducing Emission from Deforestation and forest Degradation plus the role of conservation, sustainable management of forests and the enhancement of forest carbon stocks
RPP	Readiness Preparation Proposal
SIS	Safeguard information systems
UNFCCC	United Nations Framework Convention on Climate Change

REPORT STRUCTURE

An introduction to REDD+ requirements, current debates on implementation and the role of community-based monitoring, are discussed in Chapter 1. Chapter 2 covers the implementation phase of the project, partnership-building and guaranteeing local ownership and participation. In Chapter 3, the authors go into more detail on the experience of using digital technology in a remote forest context, discussing important considerations related to capacity building, data management and sharing. Monitoring activities are discussed in detail in Chapter 4, with a focus on the importance of a community-embedded monitoring framework. An evaluation of the project is provided in Chapter 5, which includes lessons learnt, and impacts. The report concludes in Chapter 6 with a discussion of the existing achievements and challenges of the first phase, and next steps for the project. Throughout the report, boxes and tables provide more detailed information on project activities and key concepts.

1. INTRODUCTION

1.1 REDD+ AND INDIGENOUS PARTICIPATION IN GUYANA

Guyana is country with high forest cover and low deforestation rates. Its forest area covers approximately 85% of its total territory[i], totalling about 18.5 million hectares. This is distributed across State Forest Area, State Lands, Protected Areas and titled Amerindian villages, and a deforestation rate of between 0.02% and 0.079% per annum[ii].

However, there is an increasing risk facing Guyana's forests, due to large- and small-scale mining activities, which cause 93% of deforestation in the country[iii], as well as the extraction of timber, and infrastructure developments associated with these industries: the majority of forest change has occurred around existing roads and navigable rivers. Meanwhile, due to market integration and increasing trade with Brazil, the agricultural sector is a source of growing pressure. While deforestation rates are lower in Amerindian titled lands (0.04% in 2012), mining is again the primary driver of deforestation, accounting for 95% of forest change[iv].

To avoid further deforestation, Guyana has, since 2006, actively pursued REDD+, the international policy mechanism to 'reduce emissions from deforestation and forest degradation, plus the role of conservation, sustainable management of forests and the enhancement of forest carbon stocks'. In 2009, Guyana and Norway signed a Memorandum of Understanding (MoU) on implementing Guyana's plan to shift towards more sustainable extractive industries and forest management, known as the Low Carbon Development Strategy (LCDS). Through this MoU, the two countries established a framework for implementation, with up to USD 250 million in performance-related finance over five years, ending in 2015. The three main pillars of this strategy are: (1) avoiding deforestation, (2) promoting low carbon development, and (3) adapting to climate change.

There are two components in the LCDS that are critical in order to achieve effectiveness and equity:

1. The development of a system for monitoring, reporting and verification, in order to measure and track changes in Guyana's forest carbon stocks and determine performance-related payments under the MoU; and

2. The recognition of the importance of multi-stakeholder participation – in particular the participation of indigenous communities dependent on forests - in designing and implementing the LCDS.

Amerindians currently hold legal title to 13.9% of the land in Guyana, and therefore the engagement of forest-dependent communities is particularly relevant[v]. Although Amerindian and private land are initially excluded from the LCDS (which only covers State Forest Land), the Government of Guyana intends to give titled Amerindian communities the option to participate in the LCDS and opt into an agreement on REDD+. This would be in return for a pro-rata share, in future, of compensation payments received by Guyana. Guyana's Office of Climate Change (OCC) is currently leading a process, along with the Ministry of Amerindian Affairs (MAA) and the National Toshaos Council (NTC), of public participation and consultation for the development of the opt-in mechanism. A benefit-sharing structure is not yet in place, but payments could be made to communities directly or via an Amerindian Development Fund.

1.2 THE NORTH RUPUNUNI COMMUNITY-MRV PROJECT

The rich and diverse landscape of North Rupununi, located in south-western Guyana, includes old growth tropical forest, savannah and wetland ecosystems. Amerindian Makushi people make up the majority of the population of the region. While many continue to practice traditional subsistence activities, such as farming, hunting, fishing, logging and crafts, the sustainability of local livelihoods in the region is increasingly under threat due to development of the country's interior - especially external threats from mining and road building (e.g. the Georgetown-Lethem Transport Corridor[5]) and the social and environmental pressures that accompany them. As a result of such developments, access to forest resources, and to markets that were previously remote, has increased. This has resulted in growing community awareness that forest resources need to be managed in more sustainable and systematic ways. Participation in forest monitoring under a REDD+[6] regime is seen as a way to better understand and address these growing pressures, while also supporting communities wanting to diversify and develop their livelihoods.

[5] This project is part of the Integration of the Regional Infrastructure of South America Initiative (IIRSA), a joint development plan of the 12 countries in the Union of South American Nations (UNASUR). The initiative aims to promote regional economic growth through enhanced transport, energy and telecommunications networks.

[6] Reducing Emission from Deforestation and Forest Degradation plus the role of conservation, sustainable management of forests and the enhancement of forest carbon stocks.

The Community MRV project was established in 2010 in collaboration with North Rupununi District Development Board (NRDDB) - representing sixteen Amerindian communities, the Guyana Forestry Commission (GFC), the Iwokrama International Centre for Rainforest Conservation and Development (IIC) and the Global Canopy Programme (GCP).

The overarching aim for the first phase of the project was to pioneer a mechanism through which communities in Guyana could monitor their forests, and also possibly receive payments or other benefits through a REDD+ opt-in mechanism being developed by the Government of Guyana, by providing information needed under Guyana's national monitoring, reporting and verification (MRV) system. It would do this by bringing together local and national institutions to test and demonstrate the efficacy and value of a community-based monitoring model for the national MRV system and wider REDD+ policy frameworks.

Under a Memorandum of Cooperation signed between NRDDB and GFC in 2011, it was agreed that Annai District, comprising a collective land title for five villages (Annai Central, Kwatamang, Rupertee, Surama and Wowetta), would serve as part of the REDD+ Community Demonstration Site (CDS) under the framework of the national Monitoring, Reporting and Verification (MRVS) Roadmap[7]. Data on local drivers of forest change and carbon stocks, and results of ground truthing activities on satellite data for past deforestation events, were to be collected and shared with the GFC and the National MRVS Steering Committee.

Beyond this, sixteen communities in the region (see Figure 1) would benefit from forest monitoring in their territories, through direct employment and learning opportunities, institutional strengthening, and improved resource and territory management.

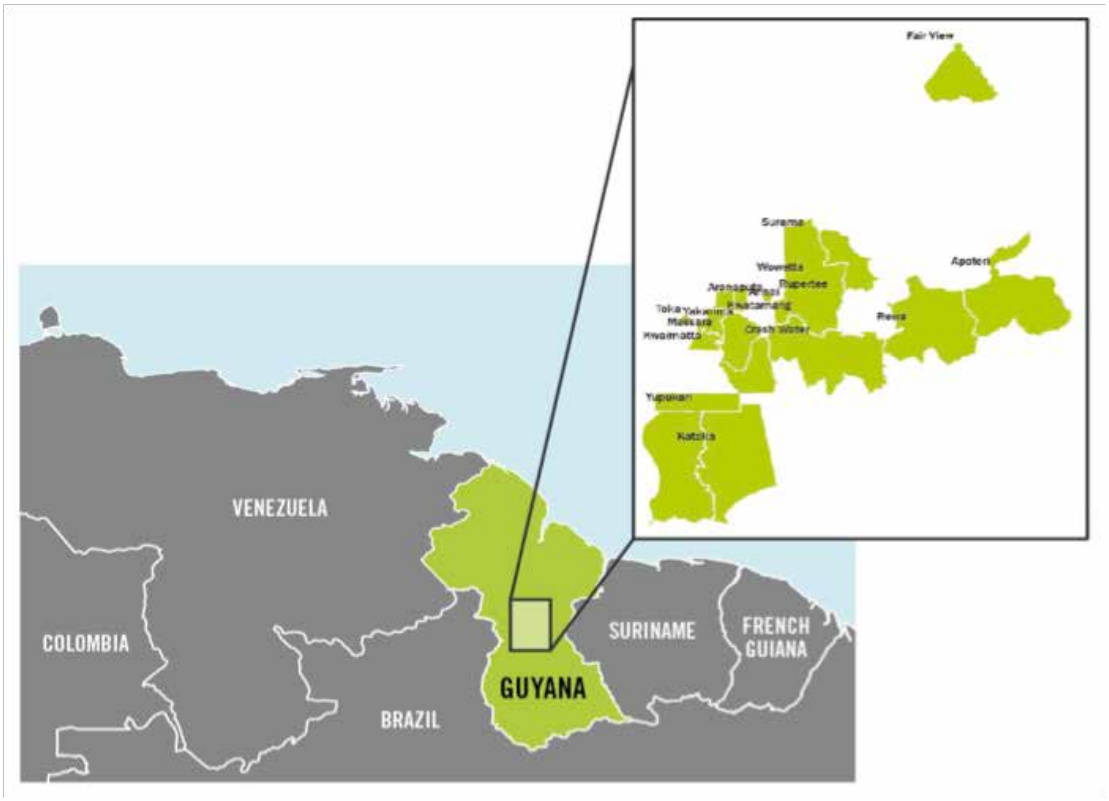

Figure 1. Map of the participating communities in the North Rupununi, Guyana

[7] The National MRVS Roadmap which outlines the requirements, capacity gaps and key capacity development priorities for establishing an MRV system; it highlights the need for sub-national MRV systems to enable the monitoring of local REDD+ activities. An important component of the MRVS Roadmap is that of REDD+ demonstration activities to address drivers of forest change in mining, forestry and community sites.

BOX 1: COMMUNITY-BASED MONITORING AND REDD+

Globally, more than 20% of tropical forests are under community management.[vi] This figure is rising as governments recognise both the rights and role of communities in sustainable forest management. It is widely argued that community-based monitoring can foster forest stewardship, increase awareness and participation, and contribute to more effective community resource management and development plans, while also improving intervention programmes.

More efficient, effective and equitable REDD+

A fundamental component of REDD+ implementation will be the development of a robust and cost-effective national MRV system to measure changes in forest areas, track carbon stocks/flows, and report on the effectiveness of different activities and policies in reducing emissions. Community-based monitoring could play an important role in these systems by providing: valuable insights into local drivers of deforestation and forest degradation; regular data on carbon stock measurements; real-time updates on forest changes; calibration of satellite data systems; and validation of remote-sensing estimates through ground truthing. Studies have also demonstrated that community-based monitoring can be advantageous in terms of lowering the cost of data collection, while delivering accurate and reliable data that is comparable to that collected by trained scientists.

More importantly, community-based monitoring can be a valuable model for meeting REDD+ requirements under the United Nations Framework Convention on Climate Change (UNFCCC) mandate that specifies that the REDD+ mechanism must ensure the full and effective participation of relevant stakeholders.

Beyond this, community-based monitoring can provide valuable information on the impacts of REDD+ activities on wellbeing, livelihoods, biodiversity, ecosystem services and other indicators. This data can be used by governments to provide information and report on how safeguards for avoiding negative social and environmental outcomes are being addressed and respected, through a Safeguard Information System[8] for national REDD+ and related forest policies. As such, community-based monitoring is increasingly being recognised as an important approach in achieving a more efficient, effective and equitable REDD+ implementation.

Further reading

There is a long history of community-based monitoring in tropical forests and much work has been done to explore and explain how this can link to national monitoring for REDD+. The following studies provide more in depth analysis:

Austin, K. & Stolle, F. Community-based monitoring in Hewson, J., Steininger, M. and Pesmajoglou, S., eds., 2013. REDD+ Measurement, Reporting and Verification (MRV) Manual. USAID-supported Forest Carbon, Markets and Communities Program: Washington, DC, USA.

Danielsen, F., Adrian, T., Brofeldt, S., van Noordwijk, M., Poulsen, M. K., Rahayu, S. & Thoumtone, V., 2013., Community Monitoring for REDD+: International Promises and Field Realities. Ecology & Society 18(3).

Palmer Fry, B. 2011., Community forest monitoring in REDD+: the 'M'in MRV? Environmental Science & Policy 14(2), 181-187.

Pratihast, A. K., Herold, M., De Sy, V., Murdiyarso, D., & Skutsch, M., 2013. Linking community-based and national REDD+ monitoring: a review of the potential. Carbon Management 4(1), 91-104.

Skutsch, M (ed), 2010. Community forest monitoring for the carbon market. Earthscan, London.

[8] The United Nations Framework Convention on Climate Change (UNFCCC) Decision 12/CP.17 states that a Safeguard Information System should provide information on how all the safeguards defined at the UN climate conference in Cancún in 2010 are addressed and respected, and that a summary of this should be included in national communications to the UNFCCC.

2. PROJECT IMPLEMENTATION

2.1 KEY PROJECT STAKEHOLDERS

Communities

Sixteen predominantly indigenous Makushi communities of the North Rupununi region of Guyana are actively involved in the project. Politically, these communities are represented by their own Village Council and the North Rupununi District Development Board (NRDDB), the two high level decision-making bodies in the communities. The NRDDB consists of all Toshaos[9] plus a second representative from each of the 16 Village Councils. The Board acts as the de facto governance body for the development of North Rupununi. At the national level, each village Toshao is represented at National Toshaos Council (NTC).

The NRDDB acts as the implementing organisation for this project. It employs the local project management team and community monitors, is responsible for activities on the ground, and acts as the interface between the project team and the village leaders. The NRDDB also represents the project in the Memorandum of Cooperation (MoC) with the Guyana Forestry Commission (GFC).

At the village level, the decision-making authority on village land-use regulations, management and development issues is the Village Council, which comprises the Toshao, elected community representatives, and a few permanent 'elders' - or Village Councillors.

Government

The key government body involved in the project is the Guyana Forestry Commission (GFC), which is responsible for the implementation of key technical aspects of the national REDD+ programme including the development of the national MRV System. Other important government stakeholders include the Office of Climate Change (OCC), the MRVS Steering Committee, which is responsible for designing the MRV System under the LCDS, and the Ministry of Amerindian Affairs (MAA).

Project Facilitators

The Global Canopy Programme (GCP), a tropical forest think-tank based in the UK, raised funds for and initiated this project together with the Iwokrama International Centre (IIC). The ICC is the institution responsible for managing the Iwokrama Forest, and has been implementing sustainable development and research programmes with indigenous people living in and around the forest. GCP coordinates the distribution of funds to partners, ensures that project deliverables and objectives are being met, and provides advice, training, and technical support to NRDBB. The IIC facilitates communications between the project team and national stakeholders, including the Government of Guyana, and provides local technical advice and training to the community monitors.

A facilitator, in the context of this project, is an external organisation that supports and enables the implementation the project. This may include, inter alia, training, technical support, and facilitation with stakeholders and donors.

[9] Toshaos are the democratically elected leaders of their communities. Elections occur every three years and a single person may be in office for two consecutive terms (six years). The last Toshao elections took place in 2012 during the months of March-April. Toshaos are supported by Deputy Toshaos, who are responsible when the Toshao is out of the village, and by Senior Councillors, and other elected members of the council.

BOX 2: FREE, PRIOR AND INFORMED CONSENT

Free, prior and informed consent (FPIC) refers to the collective right of indigenous peoples to participate in decision-making and to give or withhold their consent to, or withhold it from, activities affecting their lands, territories, resources and rights. FPIC is enshrined in Guyana's national law[10]. In the context of REDD+, FPIC principles have been adopted to ensure that the rights of indigenous communities are protected.

The FPIC principles have guided all aspects of this project, in particular its design and implementation, and the adoption of appropriate approaches for data ownership and sharing, and for decision-making.[11,vii] In addition, training on FPIC theory and processes was provided to the NRDDB Board to help build understanding and guide on-going and future engagements and decisions related to REDD+ and the proposed 'opt-in' mechanism, and any other matters affecting Amerindian communities of the North Rupununi.

Further reading:
Springer, J. & Retana, V., 2014. Free, Prior and Informed Consent and REDD+: Guidelines and Resources. WWF Working Paper. Available at: wwf.panda.org/about_our_earth/all_publications/?214094/Free-Prior-and-Informed-Consent-and-REDD--Guidelines-and-Resources

[10] Both the Guyana Constitution (2003) and the Amerindian Act (2006) state that Amerindian Village Councils and Villages can give or withhold consent to activities affecting their protected lands.

[11] A Free, Prior and Informed Consent (FPIC) Briefing Note, based in this CMRV project, was accepted by the GFC as a point of reference for the LCDS "opt-in" mechanism for indigenous communities. The briefing note was delivered in April 2013 and in August the project was informed that GFC has recommended it as the FPIC process under the MRV system.

Table 1: Building partnerships and initial project planning

Activity	Content	Who	When	Additional comments
Meeting	Developing project concept and elaborating proposal	GCP IIC	April - Dec 2009	
Contract / Document	Project approved by funders (NORAD)	GCP	April 2010	
Meeting	Revision of project design and approach.	GCP IIC NRDDB	April - June 2010	Discussions were held with NRDDB to ensure the project was aligned with the needs of local communities. This consultation resulted in several important changes, including the recruitment of a larger team of local staff and the remuneration of monitors.
Meeting/ workshop	Presentation of project to GFC and national MRVS Steering Committee	IIC NRDDB	June 2010	
Desk work/ Research	GFC project review and amendments	GFC	June 2010 – May 2011	
Meeting/ workshop	Final project proposal approved by local communities	NRDDB	April 2011	
Document/ formalisation	Formal project Briefing Note signed off by GFC	GCP IIC NRDDB GFC	May 2011	After funding was approved, there was a 13-month consultation period between all partners to reach agreement on the project's rationale, objectives and processes of engagement.
Public meetings	Agreement of Annai District as the Community Demonstration Site	NRRDB Board 16 Village Councils GFC	June – July 2011	The Government's request for Annai District to form the Community Demonstration Site was referred to the Toshaos and Village Councils for approval. Meetings were held in all 16 villages. No objections were raised and all villages endorsed the proposal. This approval was then formalised with the GFC.
Document/ formalisation	Memorandum of Cooperation (MoC) agreed	GFC NRDDB GCP	August 2011	The MoC recognised the common interest of the partners and key roles and deliverables.
Contract / Document	Sub-grant agreement between GCP and local partners	GCP IIC NRDDB	August 2011	

Workshop	Kick-off and planning workshop	GCP IIC NRDDB CREW Toshaos	Nov 2011	
Reporting/ feedback	Community outreach	PMT CREW	Nov 2011-Jan 2012	The project was reintroduced to and discussed with all villages through a series of presentations by local staff.
Meeting/ workshop	Official project launch in Annai	Partners GFC	Jan 2012	
Meeting/ workshop	Stakeholder Advisory Committee established	GCP IIC NRDDB	Jan 2012	NRDDB, IIC, GCP, GFC, Guyana's Office of Climate Change, the Ministry of Amerindian Affairs and the National Toshaos' Council became part of the Stakeholder Advisory Committee to ensure synergy between the project and the national MRVS framework.
Reporting/ feedback	Progress Report to MRVS Steering Committee	NRDDB	March 12 / Sept 12 /Aug 13	Submission of progress reports to the GFC and the national MRVS Committee by project team.

2.2 PARTNERSHIPS AND GOVERNANCE

While the project was officially initiated in 2010, building and formalising partnerships with community leaders and national governments was a lengthy process. Initial GCP contact with the NRDDB was in 2008 and after initiation, it took over a year to conclude and gain final tri-partite approval in writing. Building partnerships between communities, the government and the facilitators involved clearly defining the project's objectives, the roles and responsibility of each partner, processes for decision-making, and a work plan to achieve the desired impacts. Greater community participation and ownership was gained by engaging community leaders and existing decision-making structures; this was central to building partnerships and defining project governance, as well as addressing FPIC requirements. Table 1 captures the key activities and organisations involved in partnership building and the initial planning of the project.

2.3 LOCAL PROJECT TEAM PARTICIPATION

Once all partnerships were formalised, a local project management team (PMT) and community resource and environmental workers (CREW) were recruited. Working with a local team was essential for strengthening community ownership, building local capacity and ensuring a fully participatory project. Involving the local team and community leaders in various stages of project planning and implementation was also instrumental in building trust.

The project management team was hired in October 2011 under the NRDDB and supported by IIC. It consists of a Project Manager, responsible for overall project management; a Field Coordinator, responsible for coordinating monitoring activities; a geographic information system (GIS) Officer, responsible for data management, storage and visualisation; and two support staff to assist with data input and processing, and general project administration.
Between October and December 2011, two CREW were selected for each of the 16 communities. Job advertisements were posted in public spaces and broadcast on the regional radio station. Female monitors were encouraged to ensure a gender balance. Candidates applied to their Village Council, and their suitability and commitment was assessed through an informal interview.

In June 2012, a GCP Field Director was hired to facilitate better communication between GCP and local partners, and to support project implementation on the ground.

Recruiting a local Project Management Team with regional knowledge and the respect of community leaders was crucial to successful implementation. Yet some important challenges arose nevertheless, in connection with the hiring of the CREW:

Recruitment

Although the recruitment process was considered thorough and inclusive by the Toshaos and Village Councils, there were reports that a few CREW members had been recruited through favouritism.

Staff turnover

Over an 18-month period, nine monitors from six communities left the project - a turnover of 28%. High staff turnover puts the community's ongoing capacity to run the project at risk due to the level of training needed to collect the data. Although new CREW were hired to replace those who left, it was difficult to ensure they had consistent training.

Remuneration

The project provided remuneration equivalent to the salary of the average local teacher, to recognise the work being done by community members and the time being taken away from other livelihood activities, and as a way of generating an alternative form of employment in the region, to avoid people leaving the project for other job opportunities, in mining camps for example. At the same time, remuneration for monitors was occasionally a source of tension, with some interviewees arguing that they too should be paid for the time they spent answering questions.

Training. Credit: Jon Parsons

3. MONITORING SYSTEM

3.1 THE MONITORING FRAMEWORK

A key step for implementing a monitoring system was defining and understanding monitoring indicators, and identifying and prioritising the information most relevant to all stakeholders. Balancing external data requirements with community needs is a fundamental component to ensure support and relevance of community-based monitoring schemes. In order to do this, a series of participatory workshops were held to identify and prioritise the information most relevant at the local level. The key activities in developing the monitoring system are shown in Table 2.

Table 2: Developing the monitoring framework

Activity	Content	Who	When	Comment
Workshops/ Meetings	Discussing and prioritising what to monitor	GCP Toshaos Village Councils NRDDB IIC PMT CREW	Nov 2011	Toshaos and Village Councillors expressed interest in monitoring wellbeing, changes in the use and availability of natural resources, and water quality, among other issues. Due to capacity constraints, not everything could be monitored and needs were therefore prioritised. Priority was given to a realistic set of subjects that would provide relevant information for management decisions at the village and district level (community goals) and for REDD+ (government goals).
Workshop	Deciding which natural resources to monitor	Toshaos Village Councils PMT CREW	Nov 2011	CREW carried out assessments to determine the most important natural resources in each village. Resources were divided into four categories: game, fish, timber and 'other' natural products.
Desk research	Developing a monitoring framework to include local, national, and international priorities	GCP NRDDB IIC	Aug 2012	Indicators and variables relevant to the national level and broader international REDD+ priorities that were not already addressed by the community, were integrated into the monitoring framework.
Reporting/ Feedback	Feedback on monitoring framework	GCP Toshaos Village Councils NRDDB IIC CREW	Nov 2012	Finalising the monitoring framework was a long and challenging process, largely due to the complexities of ensuring a truly participatory process among so many different stakeholders.

In order to contribute towards village and district level development plans on natural resource management, indicators on community wellbeing and changes in the use and availability of natural resources were highlighted as priorities and included in the monitoring framework (Table 3).

Given the agreements with Guyana Forestry Commission on developing activities for the Community Demonstration Site (CDS) that could inform a national MRV strategy, the project was tasked with the collection and provision of three principal data sets: (1) delivering regular reports on local drivers of deforestation and forest degradation at the community level; (2) performing ground truthing exercises as part of verification activities to validate remote sensing data; and (3) providing carbon stock measurements on community-owned land for further validation purposes.

In addition to data (shown in Table 3 under 'Forest Change') required by the Guyana Forestry Commission as part of the Community Demonstration Site, the communities also decided to monitor other themes of interest such as natural resources and wellbeing.

Therefore, taking into account multi-stakeholder interests, the resulting monitoring framework focused on four key themes: natural resources, forest change, wellbeing, and project impacts. For each theme, indicators and methods for data collection were clearly defined. A monitoring plan, outlining what, how and when to monitor, was consequently agreed by all parties.

Table 3. Outline of monitoring framework

	Information gathered
NATURAL RESOURCES	**Community resources mapping** Mapping of land use, vegetation cover and natural resources extraction location
	Natural resource use and availability - game, fish, timber, non-timber forest products (NTFPs) Trends in extraction, frequency of extraction, availability of species, amount extracted, seasonality, commercialisation and changes in use with a focus on declining species; level of understanding of management plans
	Freshwater quality and quantity Water sources, use, sources of contamination, treatment, and perceptions of changes in water resources and impacts
FOREST CHANGE	**Traditional and commercial farming** Makushi farming practices and trends; emergence of commercially oriented farming activities (location, area, quantity produced and sold, crop types, destination, farm inputs)
	Drivers of forest change - primary and secondary road impacts; forest fires; logging. Type, location and area of deforestation and degradation per year
	Biomass Carbon stocks in different fallow and primary forests
	Ground-verification Ground-truthing of forest changes detected by satellite imagery
WELLBEING	**Wellbeing** Status and changes in community wellbeing including health, education, wealth, social issues, cooperation, happiness, community relationships (cooperation, sharing, participation), faith and beliefs, income and assets, culture (language, activities, household design), community safety/stability (thieving, alcoholism, migration, resource exploitation), food and family (relationship, family support, sufficiency of food), emotional wellbeing, education, health, infrastructure
	Mapping of community infrastructure Location of houses, schools, churches, health clinics, businesses, roads, landing strips and other infrastructure.
IMPACTS	**Project Impacts** Evaluation of changes in knowledge, technical capacity and wellbeing as a result of CMRV

3.2 HARNESSING TECHNOLOGY

A key element of the project was the adoption of mobile phone technology for data collection, processing and reporting. After the community had tested of a number of different mobile phones, they selected to work with ruggedised Android (Samsung Galaxy X Cover) smartphones and Google's Open Data Kit (ODK) software to collect and manage their data (figure 2). The Samsung phones were selected for their relatively low costs and high functionality (GPS[12], screen size and battery life). ODK is open-sourced software that has a proven track record in other monitoring initiatives. The whole system relied on cloud storage (storage of digital data across multiple servers via the internet, managed by a hosting company) to enable quicker data sharing, unlimited storage and remote access from multiple locations.

The local project management team used Microsoft Excel to customise data collection forms for each of the different monitoring themes. The data collection forms were then converted to XML format and uploaded to the internet, from where they were downloaded by the community monitors onto the smartphones. These ODK forms enabled a variety of data to be collected, including point data and images, exploiting the integrated functionality of the smartphones, which included a GPS and camera. Data were then gathered offline by the CREW and later uploaded to an online server where the data were processed and audited. Data were analysed by the PMT with differing levels of support from Iwokrama and GCP using a wide range of tools including Microsoft Excel, Arc GIS and Google Maps Engine. Separate reports were produced for the communities, the village councils and the GFC.

The technology used and the flow of data within the monitoring system are illustrated in Figure 2.

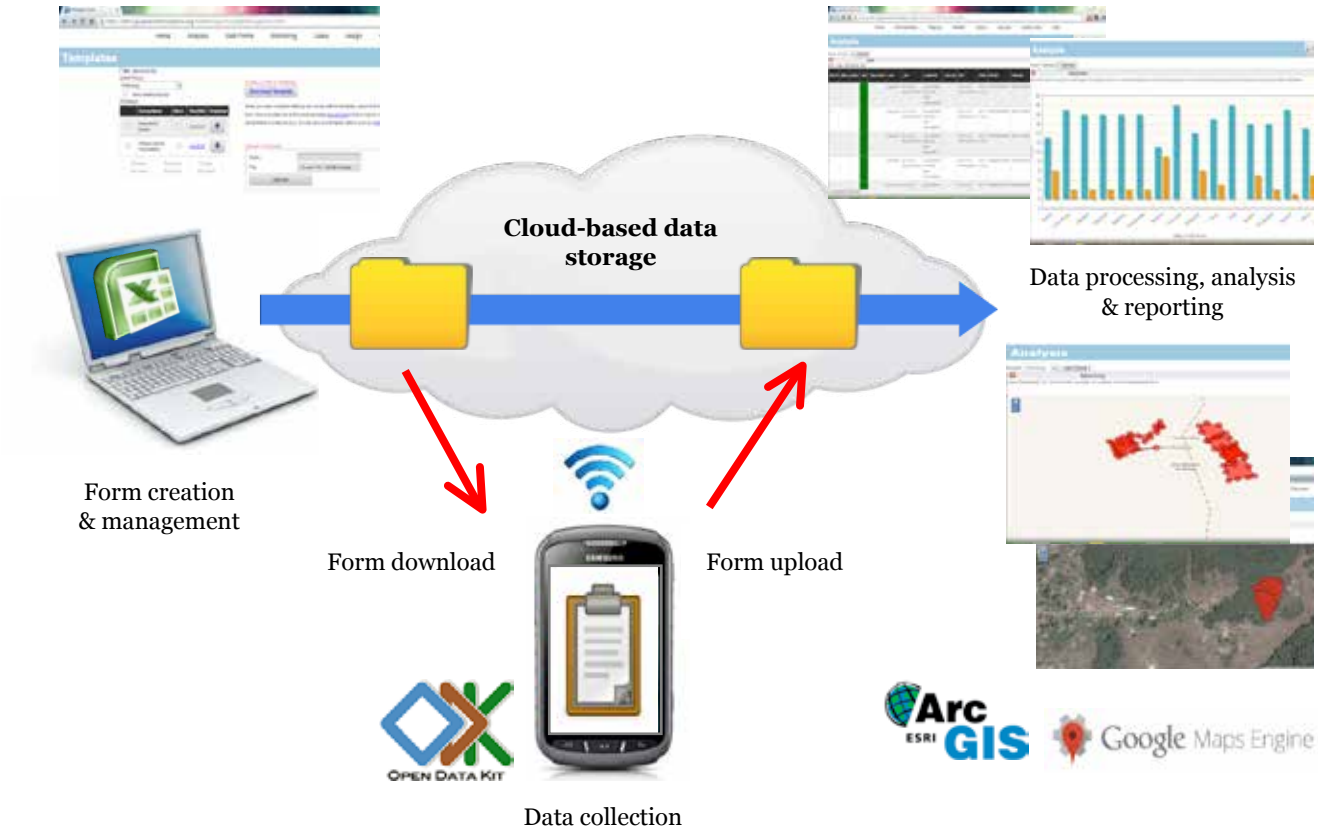

Figure 2. Technology use and data flows within the monitoring system

[12] Global Positioning System.

Table 4: Using digital technology for community-based monitoring

Activity	Content	Who	When	Comment
Research	Assessment of technology options for the project	GCP PMT	Early 2011; Jan 2012	Criteria for selecting the handheld device included: screen readability; ease of data entry; battery life; GPS capability, camera, voice recording; resistance to water, dust particles and shocks.
Training	Skills assessment of PMT and CREW	PMT CREW	Nov 2011	
Field work	Trialling a selection of android phones in the field	PMT CREW	Feb 2012	Three android phones were tested in the field by the CREW and PMT. For comparison, a dedicated GPS and specialist data-logging device were also tested. The latter were not financially viable for the project.
Training	Introduction to the technology used in the CMRV project	PMT CREW	Feb 2012	A wide range of software platforms are available to support and simplify mobile data collection, management and analysis. Key reasons for choosing Google's Open Data Kit (ODK) included the fact that it was: (1) open source and free; and (2) widely used, including by other community-based monitoring initiatives and therefore useful for sharing best practices and lessons learned.
Training	Training CREW and PMT to collect data while trialling the android phones	PMT CREW	Feb- April 2012	
Workshops	Feedback from trials and final selection of the smartphone	PMT CREW	April 2012	The phones compared favourably against the data-logging device, which was deemed too bulky and its small screen impractical (although it had a longer battery life). The Samsung Galaxy X Cover was eventually selected due to its accurate GPS, longer battery life and larger screen size compared to other phones.
Training/ Technology	Training technical team to use and manage the phones, including the installation of software, issuing of devices, and auditing of phones	GCP PMT	February and April 2012	
Training	Creating and using ODK data collection forms	PMT	April 2013	

Cont. Table 4: Using digital technology for community-based monitoring

Training	GIS training as part of the participatory community resource mapping	PMT IIC	Ongoing	
Training	Ongoing technical mentoring and remote support	GCP PMT CREW	Ongoing	
Technology	Internet set-up and management	GCP IIC	Feb 2012	Providing internet access in remote areas at the speed required was expensive. As connectivity becomes more widespread it is hoped this cost will decrease, otherwise a move away from a cloud-based system is imminent.
Technology	Set-up of cloud storage service	GCP	Feb 2012	All data collected was to be stored in the cloud or in hard drives (e.g. computer discs). An audit log of all data sets exists and is continuously updated to keep track of information has been stored and that is arriving. The initial process of collecting and storing data on handheld devices and saving it to the cloud was a difficult concept for the team to understand. Furthermore, given the sensitivity of some data and the fact that cloud storage is managed by third parties, concerns were raised about ownership, access and security of the data.

3.3. LOCAL CAPACITY BUILDING

Training and skills development

As part of efforts to build local capacity to independently run a monitoring system, the local project management team was given technical training in managing and using monitoring software and smartphone technology, in delivering workshops, training and outreach, and in processing and analysing data – a part of monitoring projects which is often carried out by external experts and facilitators.

Community monitors (CREW) were thoroughly trained in data collection methodologies for forest biomass assessments, ground truthing of forest change on community lands, and in techniques for conducting group discussions and household interviews for wellbeing and resource-use monitoring. Training also centred on building CREW capacity to communicate about the project and monitoring results in their villages.

This training curriculum followed a participatory approach that was adapted to the local situation and cultural context. Short and intensive training workshops (normally 3-5 days), with an emphasis on practical exercises, were delivered by a training team consisting of experts from GCP and IIC and other external consultants (in phase 2, this has been taken over by the project management team). Training activities were designed to help the PMT and CREW understand, test and familiarise themselves with the processes and provide feedback for improvements. These were followed up with regular remote support sessions to share know-how and address technical problems. The effectiveness of these training and skills development were later maximised through assessments of local staff capacity, which helped provide comprehensive training tailored to each team member. In addition to this, all project participants learned about relevant issues such as climate change, ecosystem services, MRV, the LCDS and FPIC.

Monitoring steps

Within a monitoring cycle there were a series of steps and management roles for each of the project team members. To support training, a project monitoring workflow was developed which clarified the different steps, and the roles and tasks of each team member (Figure 3). The development of protocols and procedures for each of the main stages helped to improve the efficiency and management of the monitoring system and field coordination.

Step 1, 'developing the methodology and timeframe for each monitoring theme', meant understanding data collection needs, logistical barriers, and defining the questions and architecture of the questionnaire form (step 2). Through a process of consultations and testing with local team members, more contextualised and easier to use ODK survey questionnaires were produced. While the process of building ODK forms was initially externally led, over time the local team acquired the skills and knowledge to lead on this.

The PMT planned and delivered training workshops on the selected monitoring theme (step 3), and data collection (step 4) was then undertaken by CREW members. Data auditing and processing happened once data was uploaded in order to identify data repetitions and flaws (step 5). Progress reports were then compiled to track ground activities. Analysis (step 6) was initially done by external staff but after training and the use of more user-friendly software much of this analysis is now being done locally. The final reporting (step 7) was dictated by the type of audience. For example, reporting back to communities on the results of each monitoring cycle was done by the local team as part of their communication and outreach activities, whereas when reporting back to government and external entities, technical support was provided by GFC and other partners.

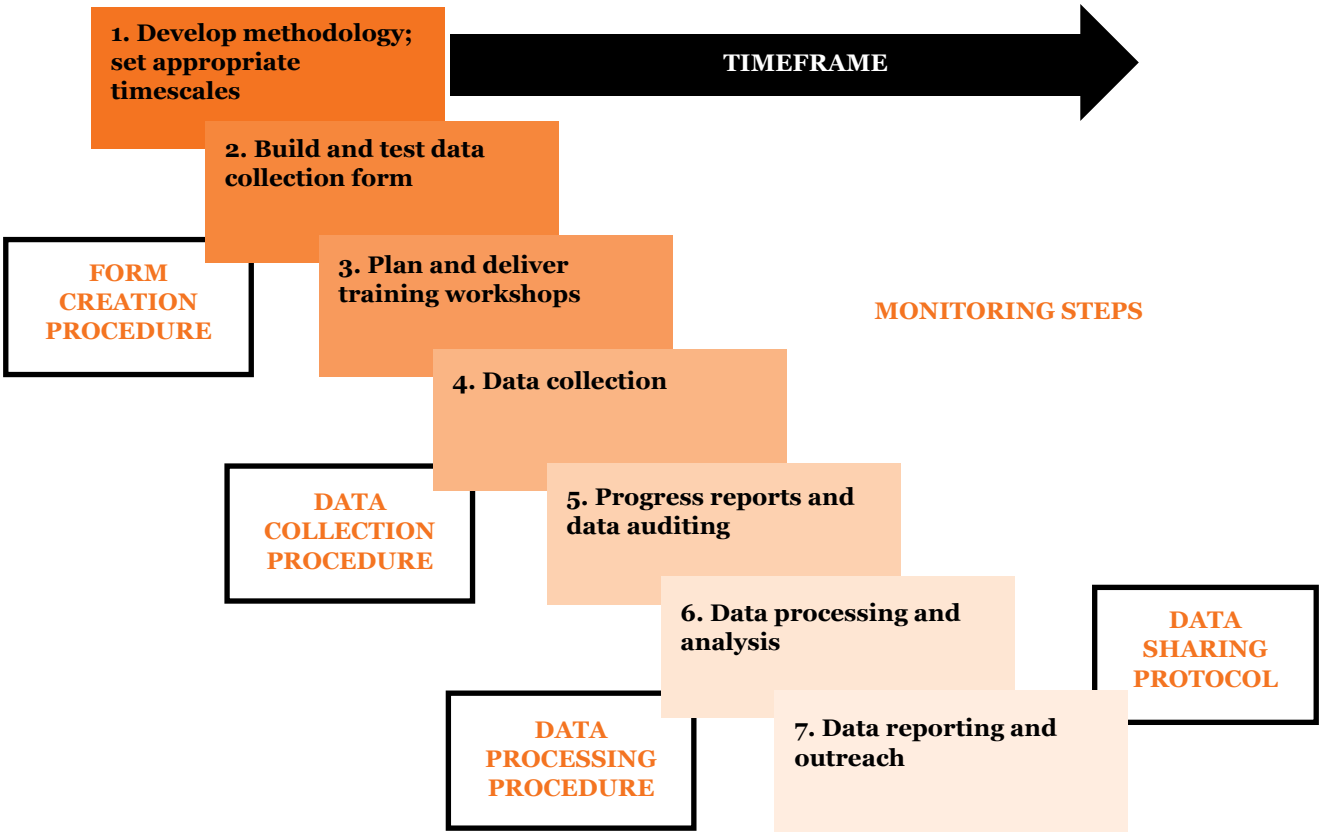

Figure 3. Steps and processes in a monitoring cycle.

Challenges

The technical skills required to audit, synthesise and analyse complex data were wide-ranging. Thanks to an easy-to-use ODK package for data management, the PMT was able to access and control this process with relatively little training. However, additional training and support from external GIS experts was still necessary.

While there are clearly advantages in using this technology, the management of android phones, unreliable internet connectivity and complications in adapting ODK software for forest monitoring purposes brought challenges and set-backs. Using a cloud-based system proved to be the biggest bottle-neck for data analysis and reporting back to communities. It should be noted that this problem has been overcome during Phase 2: data is being transferred to a laptop, which is moved from community to community, and which contains all of the software needed for data collection and management, without any need for internet. This has added benefits due to the fact that it gives project team more immediate access to the data, with project managers having the ability to analyse the data more quickly and give more frequent feedback to the monitors during the data collection process, improving the quality of the data.

Drawing a distinction between professional and personal use of the phones was sometimes challenging, as was the theft or damage of phones. Due to frequent software and hardware malfunctions, a member of the PMT was tasked with diagnosing problems, fixing damaged phones and ordering replacement parts.

Despite limited prior experience of technical tools or data analysis, the PMT and CREW embraced the opportunity to learn new technologies. They were inspired by the idea that they were breaking new ground and could share their know-how with other communities. The use of mobile phones also brought older members of the community, experienced in hunting or forests and farming, together with younger people more familiar with phones and information technology, with people of different age groups educating each other.

4. MONITORING METHODOLOGIES AND ACTIVITIES

4.1 DATA COLLECTION

Tailored ODK questionnaires were created to collect data on following broad key themes: forest change, natural resources, wellbeing, and project impacts (see Tables 3 and 4 for details).

Community mapping

One of the first activities as part of the monitoring framework was to map community lands in terms of land use, identifying burial sites, tourism zones, community infrastructure (e.g. roads, schools, and health posts), hunting grounds, fishing areas, farms, forest conservation areas, and titled lands. This was initially done using participatory mapping methodologies, working in groups with large paper maps to trace and identify these resources and landmarks. Drawn maps were then transferred to GIS. As the project progressed new data was collected and this was added to these maps.

The community mapping process is shown in Table 5. As described in the table, the laminated maps that were finally presented back to the individual communities indicated where activities such as hunting and farming were occurring outside titled lands, which triggered a debate about enlarging titled lands to incorporate areas being used by local communities – an example of the potential of community monitoring to influence decision making.

Table 5. Participatory mapping of community resources

Activity	What	Who	When	Comment
Workshop	Updating existing community resource sketch maps	CREW Villagers	Dec 2011	Existing paper maps (created for an EU-funded project in 2002) were reviewed by the CREW working with community members who were asked to identify and plot local landmarks on these maps.
Desk work	Digitising and geo-referencing the paper maps	PMT IIC	Oct – Nov 2012	Paper maps were digitized and geo-referenced by the project's GIS officer, with support from technical experts.
Workshop/ Meeting	Checking and revising the community maps	Toshaos CREW PMT	Nov 2012 – May 2013	Maps were checked by Toshaos and village leaders. Several iterations were made before they were finally approved.
Workshop/ Meeting	Printed, laminated maps presented to each community	Toshaos CREW PMT	June 2013	The maps indicated where activities such as hunting and farming were occurring outside titled lands. This triggered a debate about enlarging titled lands to incorporate areas being used by local communities.

Drivers of Forest Change

A key deliverable under the agreement with GFC was greater understanding of local drivers and processes of forest change. Farming activities within Amerindian lands were identified as the most immediate cause of forest change, while other data on logging and community infrastructure was also collected.

Table 6. Understanding forest change

Activity	Content	Who	When	Comment
Meeting	Identification of forest disturbances	PMT CREW	Feb 2012	Thirteen drivers of forest disturbance were identified by community leaders and CREW: new farm, old farm, mining, community logging, harvesting building materials, fire, camping ground, road, air strip, brick making, house building, sports field and other.
Training	Training in forest change surveys	CREW	Feb 2012	CREW were tasked in recording forest disturbances within village lands. The goal was to assess the main drivers of deforestation and forest degradation within villages. This exercise was useful for the CREW to familiarise themselves with data collection using the phones and ODK forms.
Desk work	Developing data collection forms for forest change	GCP PMT	Feb 2012	Data on vegetation type, disturbance activity, and GPS location were logged, along with photographic evidence. The area affected was estimated by the CREW. The project has since adapted the ODK application for more accurate area measurements.
Field work	Undertaking forest change surveys	CREW	Feb 2012	Over 2000 data points were collected by the CREW. Farming was the most frequent activity affecting forest cover, with old and new farms accounting for 75% of disturbances recorded.
Field work	Carrying out detailed traditional farm use surveys	CREW MRU	June – Sept 2012	A survey of active and fallow farms was undertaken by the community monitors, who interviewed household members and undertook farm visits to record the location, area, crop types and surrounding vegetation of each farm plot. For ease of estimating the area of farms and further analysis, the ODK application was adapted to link edge points of farms together to create digital polygons. More detailed information on traditional farming[13] practices was collected through structured interviews with 348 households in 12 communities by the Makushi Research Unit, a subgroup of the NRDDB. For these surveys, households with active farms were targeted. The interviews aimed to collect qualitative and quantitative data on traditional farming techniques and indigenous practice, and assess changes and impacts over a 20 year period, using the baseline information available from a previous assessment in 1995-6.

[13] Traditional Farming was defined as forest-based, rotational subsistence farming.

Ground truthing

In developing its national MRV system a key government focus is on improving the use of satellite data to increase the accuracy of forest change measurements. In this context, the project has the potential to play an important role in validating satellite data on forest change.

Community monitors ground-truthed government maps of forest change based on Landsat[14] images from 1990 - 2010 in the Community Demonstration Site. A systematic sampling approach was used over a 250m grid within the areas of deforestation. Ground-truthing was carried out at each grid point by recording the land-use type, land-use activity and geo-location, and taking a photograph. Grid points that fell in mountainous areas were omitted as they were impractical to ground-truth. Monitors had to walk long distances to cover remote locations across a large area, making the survey time consuming and labour intensive. In the field, each point was classified as an active farm, a minab (fallow farm), fire, or no disturbance. The results were analysed by the local project management team using Arc GIS. A large disconnect was found between the findings of the survey and the Landsat dataset. Further investigation is needed to verify and understand these results.

Table 7. Ground-truthing activities

Activity	Content	Who	When	Comment
Desk work	Reviewing satellite maps	PMT	Sept-Oct 2012	There were significant land cover changes detected by 2010 satellite imagery in the titled forests of six North Rupununi communities.
Training	GIS training for ground truthing	PMT	Oct 2012	A PMT member received training in Geographical Imaging Systems (GIS), which is necessary for ground-truthing.
Desk work	Identifying ground truthing coordinates	PMT	Oct 2012	Each area was overlaid with a 250 x 250m grid using GIS software. Coordinates of cross-points within changed areas were recorded and transferred to GPS devices.
Desk work/ Fieldwork	Designing and testing ODK forms for ground truthing	PMT	Oct 2012	
Field work	Visiting coordinates to record land use change	CREW	April 2013	CREW used the 'GoTo' GPS function in the field to record the type of change in land cover and take a photograph. It directs the user to a selected set of coordinates or a pre-identified waypoint.
Training/Desk work	Transferring and up-loading data; plotting results on maps; con-verting data into reports	PMT GCP	June – July 2013	A report and database detailing findings from the ground truthing, along with a summary of results from the traditional farm surveys, timber use and biomass measurements, was produced and delivered to the Guyana Forestry Commission.

[14] Landsat is a major satellite imagery program.

Biomass measurements

Above-ground biomass measurements are important inputs for national forest inventories and in monitoring changes in forest carbon stocks. A biomass inventory was therefore undertaken to provide further biomass data for the national MRV system, as well as to provide communities with a better understanding of their forests under future REDD+ regimes.

As part of efforts to test the efficacy of community MRV, and given that Guyana is already in the process of assessing biomass of different forest types at IPCC Tier 3 levels[15], the project followed the methodology used by Winrock International[16].

The activities carried out in order to conduct biomass measurements are described in Table 8.

Table 8. Biomass assessments

Activity	Content	Who	When	Comment
Desk work	Reviewing satellite maps to identify forest type distribution	GCP PMT	Feb 2013	No detailed map of vegetation types exists for the region and therefore locally classified vegetation types – high bush (primary forest), mixed bush (mixed forest) and low bush (secondary forest) – were identified from satellite imagery.
Training	Introduction to biomass assessments	PMT CREW	18 Feb 2013	The CREW and PMT were introduced to the concept of biomass, carbon cycles and the importance of understanding carbon stocks and flows in the community under future REDD+ initiatives.
Training	Biomass assessments - field methods	PMT CREW	18-19 Feb 201	Random circular nested plots (0.125 ha each) in three types of forests (117 primary and secondary plots, and 128 biomass plots in fallow plots of four different age-classes) were identified from satellite imagery and selected across the region. Data on geo-location, tree species, diameter at breast height, and soil type were recorded in a specially designed smartphone ODK form, to inform future forest inventories.
Training/ Field work	Field work trials	CREW	19-20 Feb 2013	As part of training, the CREW carried out sixteen biomass plot measurements in mature forest and fallow forests.
Field work	Plots made in each forest type and fallow farms of different ages	CREW PMT	21-22 Feb 2013	The CREW assessed 117 plots in three mature forest types (high, mixed and low), and 128 plots in fallow forests of the four age classes chosen (5-10 years, 10-20, 20-30 and 30+ years since abandonment).
Training	Analysis of plot data	PMT	March 2013	Above ground biomass was then calculated using the following allometric equation for moist forest stands.[17]

[15] The IPCC Good Practice Guidance (Penman et al 2003) and Greenhouse Gas Inventory Guidelines (IPCC 2006) provide recommendations on methods and default values for assessing carbon stocks and emissions at three levels of detail, ranging from Tier 1 (simplest to use) to Tier 3 (high resolution country-specific methods, repeated through time).[16] The Guyana Forestry Commission has recently adopted a methodology and provided training on this to the North Rupununi project teams. [17] Chave, J.; Andalo, C.; Brown, S.; Cairns, M. A.; Chambers, J.Q.; Eamus, D.; Fölster, H.; Fromard, F.; Higuchi, N.; Kira, T.; et al., 2005. Tree allometry and improved estimation of carbon stocks and tree balance in tropical forests. Ecosystem Ecology, 144, 87-99

Taking measurements. © Global Canopy Programme

Natural resources monitoring

Understanding natural resource availability and trends in extraction are of interest to Amerindian communities who rely on these resources for their livelihoods. The main activities carried out are shown in Table 9. Information was gathered on seasonality for hunting, fishing and harvesting, the importance of certain resources, preferred species, extraction methods and illegal activities. Among these themes, hunting, fishing, non-timber forest products and timber were identified as priorities for monitoring.

Table 9. Natural resource monitoring

Format	Content	Who	When	Comment
Workshop	Development of a participatory natural resource monitoring approach	PMT CREW	Aug 2012	The PMT were trained in a range of methodologies for natural resource monitoring, which included combining local knowledge with scientific methods. The data collection strategy that was developed involved a combination of group and individual interviews with 'top extractors' – the households known to extract the most of each resource type in each village (these were identified by the Village Councils). These 'top extractors' ranged in number from 1 to 24, averaging around 15 for each category and community.
Research	Developing and testing ODK interview forms	GCP	Aug-Sept 2012	ODK questionnaire forms were developed through initial discussions on indicators, questions and logistic with support from partners, PMT and CREW monitors.
Training	Preliminary training in natural resource questionnaires using ODK	CREW	Sept 2012	
Field work	CREW trial questionnaires	CREW	Oct 2012	
Feedback/ Reporting	CREW feedback from field trials	CREW	Oct 2012	
Training	CREW trained in group interview techniques	CREW	Nov 2012	This covered issues such as understanding interview questions and their relevance, different scenarios, and how best to explain the approach and methods.
Field work	CREW undertaking group interviews	CREW	Dec 2012	Group interviews (5-6 people) were conducted with village leaders, and top and average users of each resource. Information about seasonality for hunting, fishing and harvesting, the importance of certain resources, preferred species, extraction methods and illegal activities was recorded. This general background provided useful context for the more detailed information gleaned from individual interviews.
Training	CREW trained in ODK questionnaires and individual interview techniques	CREW	Jan 2013	
Field work	CREW conducting interviews with top extractors	CREW	Jan-Feb 2013	This involved a comprehensive set of questions relating to: quantity of resources/species extracted; scarcity of resources compared to historical abundance; perceived reasons for scarcity; extraction effort and locations; and amount of resource that is traded.

Wellbeing monitoring

Understanding current socio-cultural issues in the communities, the negative and positive impacts from current infrastructure developments as well as wider environmental policies such as REDD+ requires baseline data. Beyond informing local development plans and development programmes, this information is valuable for safeguards. The main activities carried out to monitor wellbeing are described in Table 10.

Table 10. Monitoring wellbeing

Activity	Content	Participants	When	Comment
Workshop	Defining the concept of wellbeing	CREW	Oct 2012	From a local perspective, the concept of 'wellbeing' was defined as 'being well' or 'having health or enough in all important aspects of life'.
Training	Training in interview techniques	CREW MRU	Oct 2012	CREW were trained in sensitive interview techniques by the MRU and GCP support team. This included using dramatised role play, and sessions on how to explain the project and build trust, on body language.
Training	Training in random sampling techniques	CREW	Oct 2012	This workshop explored the importance of random sampling techniques, and the need to add constraints to sampling, such as ensuring that equal numbers of men and women in a set age range are interviewed.
Field work	Trialling the pilot questionnaire, collecting feedback and finalising the survey	GCP MRU CREW	Oct 2012	
Fieldwork	Conducting the household wellbeing survey and Village Council consultation	CREW	Nov 2012 – Jan 2013	20 households (with 10 male and 10 female household heads or spouses) were randomly chosen from each village. The sample size was kept low to avoid interview fatigue, and where possible, male interviews were delegated to male CREW, and vice-versa to limit any gender-based effects on results. Village Council consultations/group interviews were also undertaken to understand wider inter-communal issues.

4.1.1 CHALLENGES WITH DATA COLLECTION

Understanding natural resource availability and trends in extraction are of interest to Amerindian communities who rely on these resources for their livelihoods. The main activities carried out are shown in Table 9. Information was gathered on seasonality for hunting, fishing and harvesting, the importance of certain resources, preferred species, extraction methods and illegal activities. Among these themes, hunting, fishing, non-timber forest products and timber were identified as priorities for monitoring.

Risks

Getting to isolated forest locations - often far from roads or tracks - was a major challenge. Safety concerns were raised by both the CREW and project management team, particularly regarding exposure to dangerous wildlife and transport breakdown.

Interview fatigue

Interview fatigue is a recurring problem in the villages that agreed to participate in the project. Some villagers refused to participate in more than one questionnaire; others expressed dissatisfaction with the process. This has been addressed by reducing the length and number of questionnaires, and distributing the interviews more evenly among villagers in each community. Where possible, interviews were kept to a maximum of one hour.

Further training was delivered to ensure every CREW member could explain the project's objectives, the benefits for local communities, and the rationale behind the questionnaires. More frequent visits to the villages by the project management team, helped to assuage concerns about the project and encourage local participation.

Data compatibility and verification

Integration of community-sourced data with any national system requires aligned data formatting and reporting, yet such compatibility is difficult to achieve. For example, there is no detailed vegetation map for the North Rupununi region and so locally classified vegetation types of high bush (primary forest), mixed bush (mixed forest) and low bush (secondary forest) were adopted. However, for this data to be useful at the national level the biomass nomenclature must be harmonised with the forest types used by the government. Divergence between community and national definitions – in particular on deforestation and vegetation types – reveals the greater challenge of linking indigenous knowledge systems of forests to national and scientific classifications.

In addition, data collected on above-ground biomass still needs to be verified by the government but falls within the expected range of previous estimations, and demonstrates that community monitors can successfully undertake these surveys. Furthermore, the data from the biomass plots, whilst this is just indicative, shows that these fallows hold valuable biomass which appears to increase over time.

4.2 DATA MANAGEMENT

Data processing and analysis

In many community-based monitoring projects data collection is often carried out by the local team, whereas data processing and management is undertaken by external entities due to the advanced computer and statistical skills required. By focusing on building technical capacity to process and analyse digital data, it was possible to gradually hand over this process to the local team and involve communities in all stages of the monitoring cycle. This was crucial in order to guarantee transparency and clarity about who has access to and control of the information collected, which is essential for effectively managing the large amounts of data collected and to address data sensitivities. The main activities carried out for data processing and analysis are shown in Table 11.

Table 11. Data processing and management

Activity	Content	Who	When	Comment
Desk work/ Research	Data processing methodology	GCP PMT	Sept 2010-June 2013	Methods used to analyse and process the data included: - Downloading data from cloud storage - Basic synthesis, filtering and initial auditing of data using MS Excel, - Top-level data assessment, with options for feedback to CREW - CREW assessment of the visual data outputs using Google Earth Builder and ArcGIS, to feed back for community interest - Data presented to NRDDB for analysis, discussion, and decisions on sharing, in accordance with the data sharing protocol.
Desk work/ Research/ Training	Automatic templates for initial data visualisation	GCP	Oct 2012	Automatic templates for instant conversion of data into graphs and maps were created for some datasets, using MS Excel. The synthesis of raw data into a more accessible visual format prior to analysis helped to identify incorrect data, anomalies and outliers (such as duplication when CREW occasionally surveyed the same area).
Training	Reviewing process for data collection, auditing, synthesis, reporting, feedback and sign-off	PMT	Feb – April 2012	Since data collection was part of a learning process, some errors were inevitable in the early stages. Data auditing can help identify where clarifications or changes in data collection methods are needed, provide quick feedback to the CREW, and help determine whether additional training is necessary. Difficulties in accessing and downloading data from the cloud and slow internet speeds have caused setbacks.

4.3 DATA SHARING AND REPORTING

Reporting and sharing monitoring results are the final key steps in the monitoring system. Key activities are shown in Table 12.

Table 12. Reporting to stakeholders

Activity	Content	Who	When	Comment
Meeting/ workshop	Reporting results with Toshaos, village leaders and project partners	PMT Toshaos	Jan, Apr, May, July 2013	Preliminary monitoring results for wellbeing, forest change, farming practices, natural resources, and biomass/carbon were presented.
Reporting/ feedback	Progress report to MRVS Steering Committee	NRDBB	March 2012, Sept 2012, Aug 2013	The local Project Manager sent regular progress reports to the MRVS Steering Committee. Project partners also gave a series of formal presentations to the MRVS Steering Committee.
Reporting/ feedback	Sharing interim results at public meetings in each community	PMT CREW	Nov 2012 March, April, May 2013	Sharing results with the participating communities is an ongoing process. The CREW and PMT provided regular updates and preliminary results at village meetings, creating opportunities to clarify project objectives and discuss current activities. This increased visibility and understanding of the project within local communities, and provided opportunities to address local concerns and communicate aims, outcomes and benefits with communities.
Reporting/ feedback	Multi-media reports to communities	PMT CREW	Feb, March, April, May 2013	These included posters, newsletters, radio announcements, paper reports, and laminated community resource maps for each village.
Reporting/ feedback	Progress report to Guyana Forestry Commission	NRDBB GCP IIC	March 2013, Aug 2013	A technical report on ground truthed data and drivers of deforestation and forest degradation in the Annai District Demonstration Site, as well as a briefing note on FPIC, were delivered.

Data sharing protocol

In projects where many parties are involved - in this case local community members, government institutions and external NGOs - a clear process for sharing data is essential to ensure that the local community (the data owners) maintain control over how data is used and who can access it.

Given the vast amounts of sensitive data (e.g. on wellbeing) collected in this project, a data sharing protocol was necessary in order for all stakeholders to have an agreed common understanding, and a process to manage and share data collected. It would be important for making sure that data was stored and used in the most careful and considerate way, taking into account the concerns and decisions of the communities, and to effectively address any data sharing requests which might arise throughout the course of the project and thereafter. It would provide guidelines and rules for the use and sharing of data collected as part of project, covering data storage, classification, ownership, and access to data.

The use of traditional decision-making structures helped ensure the respect of local property rights in sharing data. The NRDDB plays an important role in vetting publications related to North Rupununi and therefore all information and reports generated by the project needed to be approved by this body prior to dissemination. Ultimately, it is up to the Toshao and Village Councils in each village to decide whether to share data with other villages and organisations, including the government.

Initial workshops were held with Toshaos, Village Councils, IIC, NRDDB, PMT and GCP to understand what data and information had been collected and to identify which was deemed sensitive and required consultation and final approval. While initial views on data sharing differed widely, each of the 16 villages agreed that information on the drivers of deforestation and forest degradation, biomass and traditional farming could be shared with external entities. Others would have to go through more detailed review and consultation process. This would follow a "traffic light" data classifications system (Figure 4).

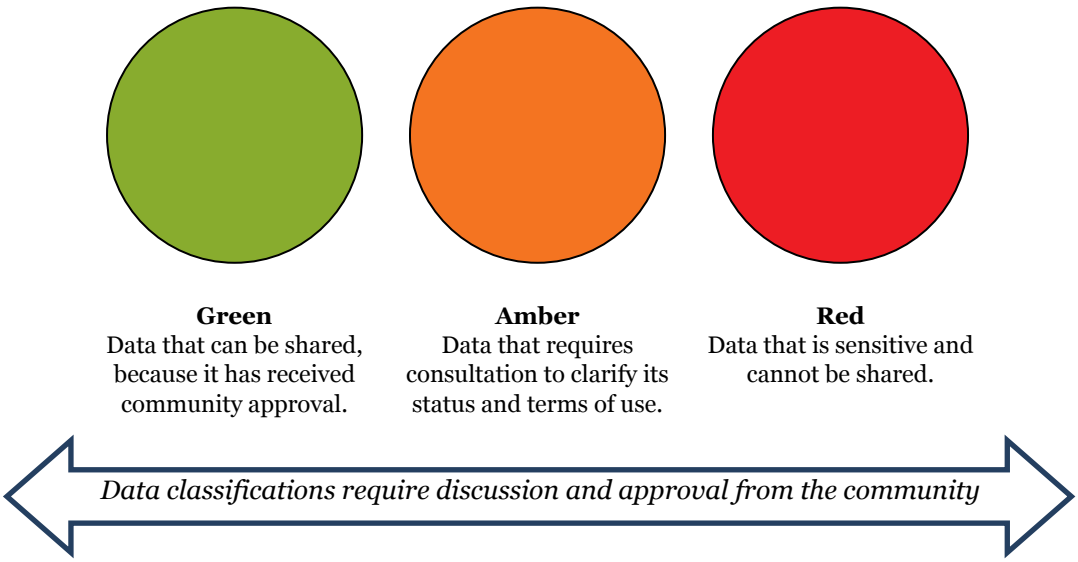

Figure 4. Data classification system.

Each data-sharing request would follow a process that involved agreed users and administrators until that data could be shared and accessed by external entities. The processes and roles related to data sharing are shown in Figure 5.

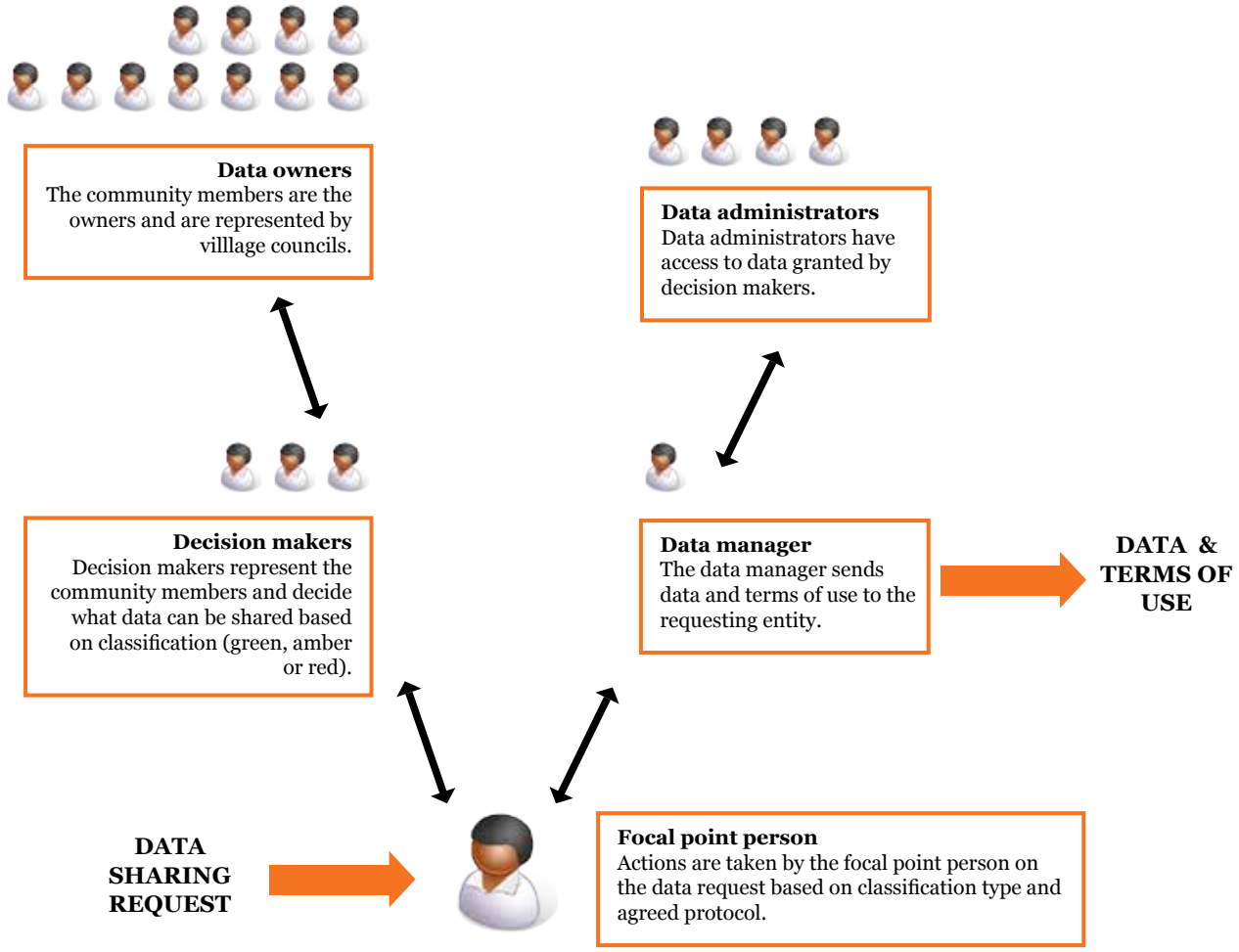

Figure 5. Data sharing process and roles

The data sharing protocol is extensive and requires numerous sessions to be held to establish a working framework. It will be finalised once the Toshaos and Village Councillors have assessed all the monitoring reports for each village. They will then continue to decide which information can be shared, under what conditions and with whom, as long as monitoring activities continue.

The data sharing protocol is ultimately envisioned as a document that:

- records the project's key stakeholders and their roles in data sharing decisions;
- categorises data into levels of sensitivity (red, amber and green);
- outlines procedures to follow for data of different categories; and
- specifies who must be consulted before any data could be shared.

It is important to note that, over time, data sensitivity can change in unforeseen ways, so regular reviews of the data sharing protocol and data categories are vital.

5. EVALUATION

5.1 METHODOLOGY

An interim project impact assessment was incorporated into the monitoring framework to facilitate honest and systematic self-evaluation, so that the lessons learned from this pilot phase could inform ongoing activities in Guyana and be useful elsewhere. It provided direct input for decision making, and also helped strengthen project partnerships and participation through feedback on the work in progress, impacts and processes.

A formal evaluation process (following Global Environment Facility monitoring and evaluation guidelines[18,viii]) was used to identify any practices that needed to be adapted or improved, with a special emphasis on meeting FPIC principles. Impacts were assessed across all stages of the project, and the assessment involved all stakeholders: partner organisations, the local PMT, CREW, Toshaos, and members of the wider community. This participatory process was particularly effective in increasing project visibility, providing opportunities for constructive discussion with a wide range of community members, including those who otherwise had little contact with the project.

Feedback questionnaires, group interviews and participatory workshop sessions were used to gather a broad range of perspectives on the positive and negative impacts of the project during the first phase of implementation. Local analogies were useful to spark creative thinking, and active workshop techniques (such as asking participants to move to different parts of the room to answer 'yes', 'no', or 'unsure', or asking individuals to present group answers to a question) were also successful. Sensitive questions were addressed using an 'honesty box' to encourage candid responses. By appointing an external team to lead evaluation workshops the project hoped to encourage more honest responses from project workers.

Furthermore as part of evaluation efforts, a social network analysis (Bodin et al., 2006) was conducted among village members in order to identify key communicators and potential 'CMRV project champions' in each village in terms of their social interactions, trust and respect. A random sample of villagers in 7 of the 16 villages were interviewed as part of this analysis and were asked to list who in the village they spoke to most, trusted the most and respected the most. Cultural salience scores (reflecting relative importance according to respondents) were calculated for all mentioned villagers[19].

[18] The project was also evaluated as part of Interim Measures MRV report for the Government of Guyana (by the organisation LTS International on Norway funding agreements).[19] 1 is the highest salience, where that person is listed top among all respondents and0 indicates 'no salience' and was never used by interviewees.

Table 13. Assessing project impacts

Activity	Content	Participants	When	Comment
Workshop	Identifying project's most significant achievements	CREW PMT	Nov 2012	Discussion centred on the positive impacts on the project
Workshop	Project review and evaluation workshop	PMT NRDDB IIC	Feb 2013	Assessing achievements, identifying problems and bottlenecks, and defining priorities. Crucially, the review and workshop also helped to galvanise a sense of common purpose among all partners, to clarify roles, and define decision-making processes. This led to the establishment of a Steering Committee, comprising representatives of the three main project partners, who agreed to meet quarterly to assess progress and coordinate management decisions.
Workshop	Assessment of lessons learned and project impacts	CREW	May 2013	The evaluation process uncovered challenges faced by the CREW, including difficulty responding to questions from other community members (especially interviewees) about the project's aims and outcomes. Some CREW also experienced difficulty gaining the respect of their fellow villagers. There was strong feedback about using uniforms for the CREW, in order to be recognised while working in their communities. The majority of the CREW expressed a strong desire to be more involved in data analysis
Workshop	Gauging perceptions, assessing successes and failures	Toshaos Village Councillors	May 2013	By including community leaders in the evaluation and feedback process the project was able to get a more in-depth understanding of how monitoring activities could be used for improved management and decision-making. The responses were overwhelmingly positive, and suggested that engagement and outreach within the villages was successful.
Field work	Structured interviews on outreach	CREW PMT	May 2013	Individual interviews were carried out to assess changes in capacity, knowledge, communications, and overall impressions of the project. Overall, there was a positive response to the project and often a desire to know more about its objectives.
Fieldwork	Identifying "project champions" and salience scores	A random sample of 70 villagers from 7 of the 16 communities	June 2013	Project members were assessed by community members on their social interactions, trust and respect in order to understand their position and role in communicating information about the project.

5.2 RESULTS

Participation and Ownership

Toshaos, Village Councillors, the CREW and the project management team took part in assessing the success of this participatory process. The vast majority of CREW (93%) felt that their contributions had been quite or very significant in influencing project design. The majority (76%) said their involvement was greater than they expected. Similarly, asked to what extent they felt that they had contributed to or influenced the project, 67% of the 30 Toshaos and Village Councillors felt their contributions had been quite or very significant. 85% felt the priorities of their communities had been taken into account in decisions about what to monitor. 78% thought the participatory process to determine the monitoring framework had gone well or very well.

Amongst the 30 Toshaos and Village Councillors who participated, 83% felt that FPIC had been followed during the first phase of the project. Suggestions about how to enhance FPIC both in the project and in the NRDDB included: monitoring the process and success of FPIC in decision-making and project steering; monthly newsletters and brochures; and more public meetings and outreach to raise awareness of the project among all community members.

Technology

Amongst the CREW, 69% felt they had had sufficient training. More than half the CREW felt they could use the phones 'outstandingly well' or 'really well' (17% and 37% respectively), while 33% answered 'quite well' and 13% 'not so well'

Amongst the Toshaos and Village Councillors, 87% of respondents said the phones had been a positive addition to the community. Some said the phones had built technological skills and knowledge in the community; had been helpful in collecting and storing data; and had helped the community make significant progress in improving their knowledge of local resources.

Communication

More than three quarters of villagers surveyed had heard about the project, and an average of three in ten villagers had been directly informed about the project, either at village meetings or through contact with CREW members. 72% of Toshaos and Village Councillors thought the content and frequency of reporting by the project team had been satisfactory and appropriate. Some said it had been excellent, with CREW frequently sharing progress reports at Village Council meetings.

Yet, among partners and project team, communication was the biggest issue raised during the evaluation. There was clearly a need to enhance channels of communication between the project team and partners (although this was successfully addressed through an early evaluation workshop), and also between the project team and the wider local community.

For instance, while more than three quarters of villagers surveyed had heard about the project, only a third could explain what it involved or what its purpose was. Although on average three in ten people had directly received information about the project, 42% felt that not enough information had been shared and 29% felt that there were problems with CMRV meetings in terms of accessibility and understanding.

While at least one CREW in each village was mentioned in each village as being among the interviewees' most communicable, trusted or respected contacts, health workers, Toshaos and Village Councillors were identified as the strongest communicators in each village. This can help inform the communication strategy, by identifying 'CMRV champions' who can most effectively communicate the project's objectives and results to community members .

Monitoring activities

Results showed that 85% of Toshaos and Village Councillors felt the priorities of their communities had been taken into account in drawing up the monitoring framework. However, the overall complexity and detail of the monitoring framework created challenges in data analysis, leading to difficulties in using the data to answer the key questions under each theme. For instance, in some cases the data collected was too detailed to be useful, especially with regards to monitoring natural resources.

Data sharing

Sharing results with the government was agreed upon prior to the evaluation and communities still felt this applied; yet sharing data with organisations outside Guyana was generally viewed with caution by Toshaos. Some were uncomfortable with sharing any data internationally; others said 'negative' information should not be shared; some flagged the need to consider intellectual property rights; and others had no problems with sharing data internationally. However, the majority (58%) of Toshaos were very positive about sharing general information about the CMRV project to help similar projects in other countries.

5.3 ADAPTIVE PROJECT MANAGEMENT

A fundamental requirement when working with new methodologies and challenging socio-political environments is to have an adaptive management model that allows flexibility and improved decision making.

Evaluating project impacts with different stakeholders provided opportunities for each group to contribute to the adaptive management of the project. The insights and recommendations on this topic were extrapolated to inform the planning of the second phase of the project, and in reviewing and clarifying roles and responsibilities to address key challenges identified. These insights and recommendations are below.

• A consistent flow of information about project aims, activities and monitoring results to community members, especially to interviewees, should be undertaken by the CREW through public meetings.

• Regular outreach activities by the PMT using comprehensible, creative and locally appropriate formats can also play an important role in maximising communication efforts.

• Additional training will be required to ensure monitors are able to clearly explain the project objectives, monitoring activities and rationale to community members.

• Local participation is fundamental at all stages of the project - from implementation and recruitment to data management – in order to guarantee transparency and ownership.

• A clear data sharing protocol needs to be established early on, requires time and should be reviewed regularly.

• The extent to which data processing can be undertaken by community members depends on existing local capacity, the type of software and technology adopted, and local infrastructure.

• Skills and infrastructure assessments, as well as field tests, are critical in assessing technology options and selecting the most appropriate technology.

• Developing monitoring methodologies requires carefully considering how data will be processed, reported and applied so that the resulting information is relevant and useful.

• Interview fatigue can be reduced by improving the design of data collection forms.

6. CONCLUSIONS

6.1 SCALING COMMUNITY-BASED MONITORING

The relevance of community-based monitoring is likely to depend on national priorities, costs and the perceived capacity and role of communities in collecting relevant data for national forest monitoring systems. This case study demonstrates that capacity can be built within local communities to run community-based monitoring systems that can collect data and produce valuable information. Beyond its contribution to carbon accounting and understanding forest change, community monitoring can collect information for social and environmental baselines for inclusion in future safeguards information systems. This information also helps inform community responses and engagement with broader REDD+ strategies. This has helped improve communities' readiness for responding to a future REDD+ opt-in mechanism. By assisting communities in assessing and understanding their forests further, local institutions can be better able to manage their forest resources in line with wider forest policy initiatives. These are some of the multiple impacts a CMRV model can offer for both communities and governments.

However, because the UNFCCC convention text on REDD+ requires national level MRV, and community bsaed monitoring initiatives are locally based, the scaling of bottom-up approaches to based monitoring is fundamental for integration. This must also include addressing the issue of data compatibility with higher data tier requirements for carbon stock estimation and reporting, and addressing misconceptions on the accuracy and utility of community generated data.

This said, harnessing digital technology such as that used in this project provides a possible pathway to facilitate the scaling up of CMRV. The use of technology enables real time and straightforward collection and aggregation of data, and removes the need to transcribe data from the field. Yet, there are several lessons learned from work undertaken as part of this project that should be considered. While technology has been an enabler for improving accuracy and data processing, and quicker data sharing, it has also introduced new challenges. Poor internet connectivity has been problematic for data uploading, access and analysis, but this has been solved in Phase 2; data collection has been hindered by challenges in adapting ODK software and hardware (Android phones) for monitoring in challenging environments. Therefore technological infrastructure investment will be essential to guarantee more reliable and effective data collection systems.

More important is the need to build and use local capacity to allow better integration with other top-down monitoring technologies being applied for national forest monitoring systems. In this context, it is also important to explore the role of technology in simplifying the process of capacity building, through features such as automated data auditing, formatting and submission to enable more community driven approaches to community-based monitoring implementation. Similarly, if technology is adopted by the government, the standardisation of methodologies is needed to ensure community-based monitoring data is relevant and consistent nationwide; protocols will need to be developed for data collection and reporting. This is necessary to ensure the alignment of reporting and standards at the community and national scales.

Alongside these developments is the need to coordinate wider and more accessible training and technical capacity building programmes to enable better interaction across different institutions and scales. Community learning networks could play an important role in knowledge and information sharing at the local level in order to scale community-based monitoring uptake and training. Recently, community-to-community training on forest monitoring has taken place between CMRV project members from the North Rupununi and Wai Wai communities in the Konashen Community-Owned Protected Area. Utilising the capacity of local institutions like NRDDB in this case, can provide a role for communities in replicating and scaling community-based monitoring approaches nationally among other indigenous communities in Guyana, for CMRV. In addition, by relying on community-based staff, this approach can also reduce the often high upfront costs of implementing a community-based monitoring system and by doing so address one of the existing impediments for national up-take.

6.2 SUSTAINABILITY

The cost-efficacy of community-based monitoring is often debated and is an important consideration for its inclusion of within national forest monitoring systems. For this project, the initial set-up costs were high and included the purchase of technology and a high number of training and participatory workshops. While the costs of the Android phones are falling and software is free, the phones need frequent replacement, and such costs, along with internet cover and local salaries, remain a challenge for the sustainability of the monitoring activities in the North Rupununi after project financing ends.

Despite this, it is quite possible that community-based monitoring, if properly managed, could offer a more cost effective bottom-up approach than the alternative of paying teams of trained but highly expensive external consultants or government workers, to provide the data needed. Community-based monitoring also offers a way to engage communities more effectively in broader deforestation issues than if consultants or externally sourced teams are hired. It is also assumed in this project that communities should benefit from REDD+ in return for managing their forests sustainably and reducing emissions from deforestation and forest degradation.

Underlying this discussion is ultimately the question of sustainability. In order to regularly collect data and maintain a monitoring system, community members undertaking this work need financial compensation for their service, as relying on community reciprocity or participation alone cannot compensate for the opportunity cost of not engaging in more attractive economic activities. Without long-term, holistic and sustainable financing for community-based monitoring, these initiatives are constrained to uncertain project level financing.

At present, policy uncertainties at the national and international level on the MRV System and future REDD+ mechanism have been barriers to progress on this matter; the timescale, funding and design of Guyana's national REDD+ programme, including the opt-in system for Amerindian communities, currently remains unclear. Defining the benefit-sharing framework and opt-in mechanism for community performance-based payments under the national REDD+ programme is an essential first step in clarifying community participation in REDD+ and further understanding the sustainability of community-based monitoring within Guyana.

6.3 NEXT STEPS

Thanks to further funding from NORAD, the CMRV project in the North Rupununi continued into a second phase under the name Forest COMPASS: Community-powered Assessment of Ecosystem Services and Safeguards. This phase continued to build local monitoring capacity to increase community ownership of the CMRV system, so that ultimately the local team would be able run the project independently. Simplifying data processing and management was an important part of this process, and a local desk-based storage system was adopted to enable this.

There was also emphasis on working with the Toshaos and Village Councils to help apply monitoring data to local development and resource management plans. Regular information flows to communities would take place through outreach activities and by using mediums such as the community radio station. There would also be greater focus on improving reporting and engagements with government institutions to push for the adoption of the CMRV model at the national level.

GCP also replicated this project in the Chico Mendes Extractive Reserve in Acre, Brazil. Lessons learned from both Guyana and Acre will help generate best-practices, standardise methodologies and produce capacity building tools. A web platform will be established for sharing experiences and results, to help inform engagements with stakeholders worldwide. The ultimate goal is to build a network of practitioners, scientists and policy makers to generate political momentum for the inclusion of a community-based monitoring model within national REDD+ programmes.

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FOOTNOTES

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