Mpingo Conservation & Development Initiative

Combining REDD, PFM and FSC certification in South-Eastern Tanzania

Project Revision 2012

A proposal submitted to the Royal Norwegian Embassy in Dar
and the National REDD Taskforce

Revised Project Summary

Project title

Combining REDD, PFM and FSC certification in South-Eastern Tanzania

Primary proponent

Mpingo Conservation & Development Initiative

Total budget

$1,948,123

Timeframe

4 years: 2010 – 2013 (this proposed revision covers 2012-2013)

Summary description of project

Integrating Reduced Emissions from Deforestation and Forest Degradation (REDD) with Participatory Forest Management (PFM) is key to ensuring benefits from REDD reach forest-adjacent communities, and that local incentives are aligned with national and global interests in conserving forests to reduce carbon emissions. The Mpingo Conservation & Development Initiative (MCDI) has extensive experience with PFM through the operational model and brand it has developed in SE Tanzania whereby communities earn revenue from selling sustainably harvested timber. MCDI holds the first Forestry Stewardship Council (FSC) certificate for community-managed natural forest in Africa. Financial flows from timber are expected to exceed those available from carbon markets over the long term, so MCDI proposes to leverage REDD as a catalyst to expand its PFM+FSC model over a wider area, bringing substantial benefits to poor and natural resource-dependent rural communities and conserving greatly increased areas of forest.

The foremost driver of forest degradation in the project area is annual burning of miombo woodlands which suppresses tree growth and biomass. The project will invest in development of a new methodology for carbon accounting in miombo woodlands affected by fire, and which will be applicable to much of the miombo biome that covers much of southern Africa.

An important component of the project involves working in collaboration with international partners to develop improved methods of measuring carbon stored in miombo woodlands, and from this developing efficient participatory assessment and monitoring procedures (drawing on MCDI's experience with participatory timber inventory) and protocols for monitoring and verification through remote sensing. Another major component of the project is the development of best practice for delivering and monitoring benefits to communities.

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Reason for the Revision

Our analysis of the different drivers of deforestation in Kilwa District, undertaken during the first year of the project, has produced the following estimates for annual carbon losses:

Source	Min	Best Guess	Max
Timber	12,000	28,000	64,000
Charcoal	2,000	4,000	9,000
Agriculture	20,000	44,000	93,000
Fire	0	74,000	450,000
Total	**34,000**	**150,000**	**616,000**

Table 1. Estimated carbon losses in Kilwa District due to different drivers of deforestation (tonnes per year).

However, MCDI's primary goal with this REDD project is to drive expansion of its sustainable timber and FSC certification project which it expects to be more lucrative for participating communities than carbon forestry. For this communities ideally want relatively large tracts of forest and woodland which have not been intensively logged in the recent past. These tend to be the least accessible forests of which there is still a substantial area in Kilwa District. For the most part these extensive forested areas are not on particularly fertile land where agriculture is likely to expand in the near future. Were these lands connected with better infrastructure or closer to a major city, agriculture may have expanded to such marginal areas, but, except for along the main north-south road (tarmacked in recent years), with obvious opportunities for easy sales of produce, most farming in Kilwa is confined to the more fertile river valleys.

Central and southern Kilwa District is still sparsely populated and highly forested. Villages and the farmland surrounding them are islands cleared from the bush rather than the islands of relict forests sitting isolated in a more anthropogenic cleared landscape which are characteristic of other parts of Tanzania. Non-timber forest products, especially woodfuels, can easily be gathered from wooded areas close to villages without having to make longer treks to a specific forest. Thus, at present the only real uses for the larger tracts of forests are logging and hunting, whether for local subsistence purposes or commercially, as part of a government-controlled hunting block.

This situation makes MCDI's proposition to communities much easier. Following a land-use planning exercise they are invited to choose an area of forest for which they have no other significant plans and set it aside as a Village Land Forest Reserve (VLFR). In contrast to some other pilot REDD projects in Tanzania, in which villages are challenged to make the hard choices between forest conservation (funded by REDD) and agricultural extensification, the short-term opportunity costs for villages entering MCDI's scheme are very low. Hence MCDI's approach carries relatively low risk for its partner communities, as they are not being asked to surrender short-term agricultural production options or activities.

These circumstances in Kilwa have consequences for the way that carbon offsets may be generated from an existing deforestation baseline, significantly changing the above calculation. Anticipated carbon losses due to **agriculture** under the Business as Usual scenario are negligible in the targeted forests. An analysis of Landsat images taken in Kilwa between 2000 and 2010 showed actual deforestation in the selected pilot villages for this project to be just 0.2% per year, and most of that was probably outside the potential new VLFRs.

Charcoal is a significant long term threat that provides the major conservation argument for acting now to put Kilwa's forests under devolved sustainable management: extrapolation from Ahrends *et al.* model of demand for charcoal centred on Dar es Salaam[1] predicts major increases in forest degradation

[1] Ahrends A, Burgess ND, Milledge SAH, Bulling MT, Fisher B, Smart JCR, Clarke GP, Mhoro BE and Lewis SL (2010) Predictable waves of sequential forest degradation and biodiversity loss spreading from an African city. PNAS August 17, 2010 vol. 107, no. 33, pp. 14556-14561.

resulting from charcoal production in Kilwa from 2020 onwards. Indeed, anecdotal evidence already suggests a significant uptick in charcoal production, especially along the main north-south road, over the last ten years. However, as can be seen from the table above, estimated total charcoal production in Kilwa is still low. The carbon markets will not pay for carbon losses averted ten years in the future, so this driver of deforestation, which was initially expected to be a primary focus of the project, does not actually present opportunities to generate significant carbon offsets over the next 5-10 years.

Timber losses are not insignificant when summed across the entire district, but logging is highly selective, and thus impacts on forest carbon stocks are small proportionately. Moreover, if markets can be found for FSC certified *Julbernardia globiflora* and other species still common in Kilwa, MCDI hopes to support sustainable harvesting across a wider range of species that exceeds the volume currently being extracted from uncontrolled selective logging. Improved forest management can certainly reduce the wastage from the processing of such timber, whilst the volume of wood that ends up in long-lived final products can be excluded from any analysis. Nonetheless net carbon losses due to uncontrolled logging are insufficient on their own to generate significant revenue streams under a REDD project.

Thus we are left only with **fire** as a significant driver of deforestation in the relatively remote forests which provide the greatest opportunities for local communities in Kilwa to generate sustained economic benefits from PFM based on certified timber harvesting. We estimate that roughly 60% of our project landscape burns each year[2], mostly during the mid-to-late dry season when new farms are cleared – fire is used as a tool to do this, and often burns out of control beyond the areas selected for farming – and also, critically, when a stiff steady breeze blows, fanning the flames across large areas. A model developed by MCDI's partners at the University of Edinburgh (UoE) suggest that between 0.5 and 1 tonne of carbon can be lost from dry forests as a result of regular (annual) hot fires from a combination of two mechanisms:

- Hot fires substantially increase tree mortality rates. The premature death of just one or two large trees in a year can amount to considerable decreases in carbon stocks.
- Regular hot fires retard regeneration, slowing biomass recovery following large tree deaths.

These findings are summarised in the table below. Note that it differs from the one above in reporting *losses per hectare* of forest.

Source	Min	Best Guess	Max
Timber	0	0	0
Charcoal	0	0	0
Agriculture	0	0	0
Fire	0	0.5	1
Total	**0**	**0.5**	**1**

Table 2. Estimated carbon losses in proposed VLFRs in Kilwa District losses due to different drivers of deforestation (tonnes per year per hectare).

A significant advantage of focusing the project on fire management is that we expect there to be negligible leakage: fires are generally not lit elsewhere in compensation for those which would otherwise have burned through a protected VLFR. Most such fires will not be deliberate and are not designed to burn such large areas, but rather spread uncontrollably from where they were originally lit. The only time such compensatory action could happen is if fires were being used for hunting (forbidden inside VLFRs); in such a case a fire lit elsewhere would most burn areas that in all likelihood would be burned eventually anyway. Thus such displaced fire activity will in fact bring forward the average burn date in the year; earlier burn dates should – in general – result in cooler fires and thus less damage to the forest. Hence any leakage may actually be positive, although the project will make no attempt to quantify that.

[2] 20% is denser forest which does not burn v easily. Of the remaining 80% some three-quarters upwards burns each year.

No project focusing on fire management in dry forests has been attempted before in the REDD+ space. Consequently, executing the project will require the development of innovative methodologies and management practices, substantially increasing project risk. However, outside analysis by a carbon markets expert suggests that the project is viable[3], albeit dependent upon donor funding at least at this early stage. Moreover, a successful project could open a whole new frontier in REDD+ opportunities: miombo woodlands stretch across some 2.8 million km^2 of southern Africa, one of the largest expanses globally of fire-affected dryland forests. The project is thus expected to substantially advance our understanding of the practicalities of addressing fire management as a component of REDD+, and greatly benefit other related REDD and PFM initiatives around the world. The potential rewards justify the risks being taken.

[3] Fehse J & Rivard B (2012) Forest Carbon Project Feasibility Assessment: The MCDI Grouped REDD Project on Fire Management in Village Land Forest Reserves, Kilwa District, Tanzania.

Proposed Solution

Concept

The basic project concept remains the same: use REDD receipts to drive expansion of PFM and MCDI's FSC group certificate. Under MCDI's existing model of certification for timber values it is projected that locally captured revenues per hectare of forest will reach $14 per year, with some villages earning annual sums in excess of $100,000. Revenues from carbon markets will enable MCDI to overcome the investment barrier it currently faces in expanding its FSC group certificate, which requires up-front investments in forest inventories, village-level organization, and development of approved management plans. Additionally, villages whose forests have already been substantially logged could benefit from some interim revenue flows while they wait for their timber stocks to recover. This is summarised in the figure below.

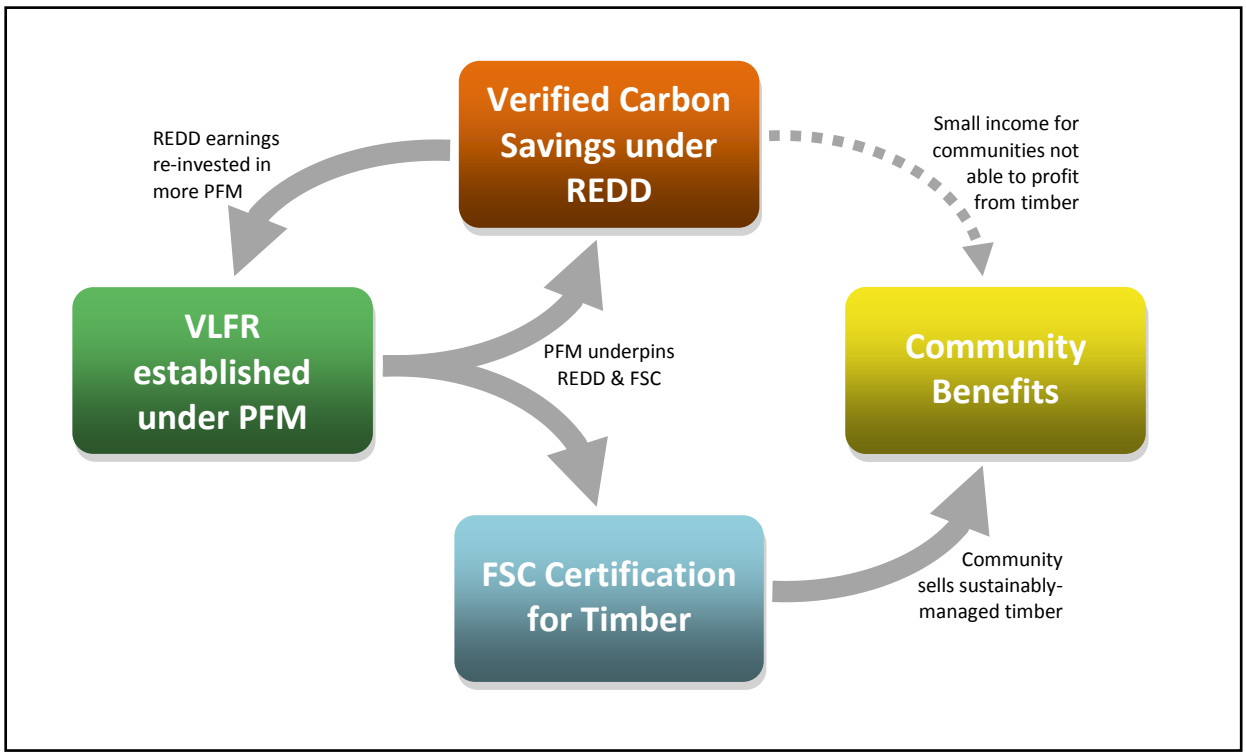

Figure 1. Links between PFM, REDD and FSC under proposed project, and revenue generation for communities.

Fire Management

In order to generate carbon offsets, we aim to reduce both fire intensity and fire frequency in the VLFRs, although focusing on fire intensity. We will achieve this by launching a programme of community-based fire management through early burning (i.e. burning early in the dry season when fuel loads are lower). In particular communities will carry out the following four management interventions designed to increase woody biomass and regeneration:

1. Thorough early burning in a strip 50-100m wide around the entire VLFR boundary. This represents a departure from the current fire control measure implemented in the FSC-certified VLFRs of boundary clearance, since that results in a significant one-off loss of carbon. This boundary burning should create an effective fire break around each VLFR.
2. Patchwork early burning inside each VLFR. Decades of experience of fire management in places such as South Africa and the American Mid-West have shown the folly of attempting total fire exclusion that leaves dry forests vulnerable to occasional catastrophic fires which are far more destructive than more frequent managed fires. Thus VLFRs will be burned on a patchwork basis

with the intention of ensuring every part of the VLFR that is vulnerable to fire burns every few years, aiming for an average fire return interval of around three years.

3. Greatest attention will be focused on the side of the forests closest to farming areas or where prevailing winds are most likely bring wild fires. Additional early burns, either in or outside the VLFR boundary, may be appropriate in such areas to provide extra protection to the VLFRs.
4. Supplementary additional burns later on where grass fuel loads have returned. This could be either as a result of regeneration – perhaps following isolated rain showers after the end of the main rainy season – or where some of the grasses were too wet or evolved to resist fires and thus had not burned in the main early burn.

This approach is appropriate in a semi-arid environment such as miombo woodlands; the ecosystem is fire-adapted and some species are dependent upon fire as part of their natural lifecycle, e.g. *Pterocarpus spp.* for seed germination. Villagers are for the most part well experienced in the use of fire, so extensive training should not be required, more the collaborative effort to provide greater focus to the use of an existing tool already widely used for landscape management.

In the early years this programme will need to be led by MCDI field staff. However, in the longer run we aim to train up community teams to manage this process themselves, thus controlling costs, and allowing us to support early burning across wider areas.

The programme will commence with an introduction for villagers explaining the importance of fire management, and how local agricultural practices impinge on the frequency of fires and thus the health of the forest. From there on the programme will focus primarily on the practical implementation of early burning. This is because it only takes one out-of-control fire to lose all the gains in a VLFR. However, at a later stage we may once again increase the emphasis on education to reduce the risks of wild fires spreading unnecessarily. This may serve to reduce the risk management buffer that well managed REDD schemes, such as those validated by the Verified Carbon Standard (VCS), require of projects, and thus increase community revenue. We believe such education efforts are likely to have greater traction once it has been demonstrated that successful fire control can yield returns.

A hitherto rare cause of fires, pastoralism, is now on the increase in Kilwa due to recent immigration from other parts of the country. Pastoralists light fires to stimulate the new leaf flush amongst grasses and thus provide additional food for their livestock. The more new grass the better so the incentives for pastoralists should favour wider-ranging fires. Owing to the nomadic lifestyle of pastoralists it may be difficult to bring them into the benefit sharing system of PFM, and education alone is likely to have only a limited impact. Grazing is proscribed within VLFRs, so pastoralists should not be deliberately lighting fires within them.[4] This reinforces the necessary emphasis on early burning as a preventative tool to ensure wild fires are kept out of VLFRs wherever possible. Involving the pastoralists in the early burning may also serve to elicit buy-in.

Anticipated Changes in Carbon Stocks

Not all of the forests and woodlands are burned every year. Higher elevation forest will burn occasionally, but greener vegetation combined with lower oxygen availability (due to thicker vegetation, especially in the understorey) often serve to prevent entry of wild fires into such forest areas, and stark boundaries between woodland, which burns annually, and forest are not uncommon within the project area. We estimate that such forest covers roughly 20% of the project area, leaving a remainder that is woodland and wooded savannah. With proper fire management we expect to see a gradual transition in these habitat types to denser vegetation, such that in time some woodland will become forest and some savannahs thickly wooded enough to be termed woodland. Such ecotonal changes will be moderated by elephants, relatively abundant in Kilwa, who, from time to time, clear trees in localised areas, pushing forest back to woodland and woodland back to savannah. This is the natural rhythm of miombo mosaic habitats which are shaped principally by the confluence of fire and elephants.

[4] That this regulation can be uphead depends on a number of things: adequate initial land use planning, continued engagement between settled villagers and roaming pastoralists, and effective patrolling.

UoE's model of fire impacts in miombo implies that forests subjected to annual burning over a period of multiple decades will be degraded and lose their woody biomass. Such outcomes have been observed in Zimbabwe, but not in Kilwa where fire management practices are not believed to have changed significantly over the last few decades, nor has population density (which would increase fire frequency) grown that much, although we lack firm data on the frequency and intensity of fire across Kilwa in recent years. We hypothesise that Kilwa's forests may be more productive than Zimbabwean miombo (perhaps driven by proximity to the coast and higher rainfall), and hence may degrade at slower rates. We do know that mean biomass stocks in Kilwa are ~75% of those in central Mozambique, which may indicate high levels of disturbance due to more frequent fires in Kilwa, and a trajectory towards lower biomass stocks. It is presently unclear whether the forests and woodlands have reached a new equilibrium or are still degrading. Thus the project will be a mix of improved forest management (stocks recovery) and possible avoided degradation (further erosion of stocks).

We have modelled the expected emissions reductions and revenues flows that will be generated as a result of the project over a ten year period. As sufficient revenue is raised it is invested in further expanding the scheme to new villages, thus the total emissions reductions, as well as project viability, depend upon the price of carbon. Assuming a fairly conservative $5 per tonne of CO_2e, Total Net Emissions Reductions (TNER) over ten years are expected to be in the range 520-560,000tCO_2e, whereas at $10 per tonne, TNER ranges from 950,000 to 1,850,000 over ten years, with up to 400,000ha of forest protected as a result. More detail on these figures is provided in Appendix II as well as the accompanying feasibility report on the proposed project by Fehse and Rivard from LTSi / Value for Nature.

Monitoring Carbon Stocks

As described above, we expect successful fire management to deliver carbon savings of 0.5-1tC/ha per year in fire-susceptible woodlands and wooded savannahs. This represents between 2.5% and 10% of existing carbon stocks per year. At the upper end this may be readily detectible, but at the lower end such changes can easily be masked by natural fluctuations ('background noise'). Thus we will require a powerful and robust methodology for detecting carbon stock changes. This methodology will combine large size permanent sample plots, monitoring of individual large trees (to detect stochastic mortality rates) and remote sensing technology. In order to increase our ability to detect actual carbon stock changes with sufficient statistical confidence, monitoring may only be carried out every two, three or four years. The exact monitoring interval is yet to be determined, but preliminary analysis suggests it does not make much difference to revenue flows when the carbon price is between $3.25 (the rough break-even point) and $5. At higher prices more frequent monitoring is preferable *if* it can reliably detect carbon stock changes.

Validating Carbon Savings

The project will continue on its twin track approach of preparing for both a regulated market at such time as it may come into effect (currently unlikely to take place at a global scale until 2020 at the earliest based on recent UNFCCC negotiations), and existing and expanding voluntary carbon markets. To this end MCDI is pursuing VCS validation; VCS is the most rigorous and comprehensive voluntary market carbon standard available, and is the closest to IPCC guidelines and draft UNFCCC requirements. No appropriate VCS methodologies for this project currently exist or are in development, although since the project was initiated a range of new REDD methodologies have been approved by VCS, and the first REDD projects have been successfully validated under VCS. Thus MCDI, with its partners, will develop a new VCS methodology suitable to the forest type and drivers of deforestation that apply to the project area.

Project Design

The overall goal and project purpose remain the same and are restated here for convenience.

Overall Goal

Institutions and selected local communities in South Eastern Tanzania are REDD ready by 1st January 2014.

Project Purpose

Pilot the integration of new financial flows from carbon offsetting activities under REDD with PFM and forest certification, leveraging these revenues as a catalyst to further expand sustainable forest management and use in SE Tanzania, bringing a further seven rural communities (~10,000 people, ~25,000ha of forest) into MCDI's FSC group certificate by end of project.

Outputs

The six original outputs stay largely as they were, with only output 4 amended, changing the focus from leakage (which, as previously noted, becomes negligible when the focus of the intervention is fire management) to simply combating drivers of deforestation. The six outputs in full now are:

1. Combined group certificate, validation and verification scheme covering timber and carbon-based products open to widest possible variety of community-managed forests in Tanzania.
2. Mechanisms to sell carbon offsets and credits for expansion of group certificate and/or forest recovery, and compatible with developing national REDD standards.
3. Efficient, scientifically robust and cost-effective methods for participatory assessment and monitoring of carbon stored in forests including soil carbon.
4. Drivers of deforestation controlled and reduced.
5. Best practice established for equitable management and sharing of economic benefits from forest conservation across the entire community.
6. Achievements disseminated with policy recommendations for national and international audiences.

Activities

The following lists all activities planned for the remainder of the project. New or amended activities are highlighted; most such amendments are refinements of ideas that already existed within the original proposal.

The timing of activities is given in brackets timed from the start of the project. Many activities are pushed back from their original timing to fit with the need to design the new VCS method.

1. Combined group certificate scheme covering timber and carbon for community-managed forests in Tanzania

1.2. **AMENDED:** Revise and sign new carbon agreements with communities (Y3).

1.3. Develop REDD Project Design Document (Y3-4).

1.4. Achieve carbon validation to industry-leading standards (VCS and CCBS) (Y4).

1.5. **NEW:** Confidence-building preliminary steps to PFM including land-use planning (Y2-3).

1.6. **AMENDED:** Complete PFM expansion to all pilot villages including FSC certification (Y3-4, budget provided by matching funds and/or results-based incentive disbursements).

1.7. Monitor participatorily avifauna biodiversity and threats to biodiversity in community forests (Y1-4).

1.8. **NEW:** Design new VCS methodology and support it through the double-approval process (Y3-4).

Dropped: old 1.5 activity of one year of parallel certificate maintenance.

2. Mechanisms to sell carbon offsets for expansion of group certificate and/or forest recovery

2.1. Participate in development of national standards and systems for sales, monitoring, assessment, reporting and verification of carbon credits (Y1-4).

2.2 Establish all necessary systems to comply with national REDD standards as they evolve (Y2-4, budget partly provided by results-based incentive disbursements).

2.3. Develop market linkages through Carbon Tanzania and international carbon exchanges (Y1-4, budget provided by results-based incentive disbursements).

3. Methods for participatory assessment and monitoring of carbon stored in forests

3.1. Assess stem and root biomass carbon in miombo woodlands in SE Tanzania (Y1-2).

3.2. Assess soil carbon in miombo woodlands in SE Tanzania (Y2-3).

3.3. Develop participatory method for assessing biomass (Y3-4).

3.4. **AMENDED:** Monitoring effects of fire on forest biomass and carbon balance (Y3-4).

3.5. **AMENDED:** Spatial analysis of regional biomass by fusing remote-sensing data with ground surveys (Y2-4).

3.6. Develop simple and efficient protocol to allow for remote verification of participatory carbon monitoring (Y4).

4. Drivers of deforestation controlled and reduced

4.2. **AMENDED:** Design programme for community-based fire management in community forests (Y3).

4.3. **AMENDED:** Implement community-based fire management in community forests (Y4).

5. Best practice established for equitable management and sharing of economic benefits

5.1. Identify and test best methods for participatory poverty assessment (Y1).

5.2. Pilot protocol for best financial management at village level with mechanisms to deliver democratic benefit sharing, with benefits felt across the community (Y1-2).

5.3. Develop methods for and establish baseline for participatory assessment of village governance (Y1).

5.4. Monitor changes in village governance (Y2-4, budget partly provided by results-based incentive disbursements).

5.5. Monitor households' socio-economic status over length of project (Y1-4, budget partly provided by results-based incentive disbursements).

5.6. Monitor communities' perceptions of project progress and impact on their lives (Y1-4).

6. Achievements disseminated with policy recommendations for national and international audiences

6.1. Publish annual policy analyses throughout life of project (Y1-4).

6.2. Document achievements and methods developed, and disseminate to national and international audiences (Y2-4).

6.3. Knowledge on carbon assessment transferred to Tanzanian partners (Y4, budget provided by results-based incentive disbursements).

6.4. Final report compiling all policy recommendations together with methods, experiences and lessons learned from pilot project (Y4).

Monitoring & Evaluation

Monitoring and evaluation arrangements stay as they currently are, mainstreamed into each of our outputs.

Financial Summary

Expenditure to Date

The table below shows financial expenditure to date by output.

Output	Budget	Spent so Far	Utilisation
1. Combined group certificate scheme	378,481	65,169	17%
2. System to sell carbon credits	75,010	16,565	22%
3. Method for participatory carbon assessment	338,723	165,715	49%
4. Controlling drivers of deforestation	140,750	8,337	6%
5. Benefit sharing best practice	242,595	79,140	33%
6. Results dissemination & policy recommendations	74,840	4,124	6%
Capital Costs	117,900	117,434	100%
Staff	348,715	137,643	39%
Evaluation	100,000	0	0%
Administration	131,109	68,137	52%
TOTAL	**1,948,123**	**662,264**	**34%**

The original budget was somewhat weighted towards years 3 and 4, but still expenditure is approximately 25% under anticipated budget ($876,638 for years 1 and 2). A major reason for this was the need, clear from late 2010 onwards, for clarity of strategy before moving forward. This proposal delivers the necessary clarity. Increasing capacity amongst MCDI staff recruited in 2010 means that a significant acceleration should be feasible with the greatest constraint likely to be availability of field cars (MCI has 3) during periods of intensive fieldwork. MCDI will look for creative solutions to this challenge.

Revised Budget

The estimated total budget for this proposed project remains US $1,948,123 over four years. See the table below for a breakdown by output (all figures given in USD). Actual expenditures for years one and two – shaded in grey – are shown for reference and completeness. Variance against original budget allocations is given in the final column.

Output	Year 1	Year 2	Year 3	Year 4	Total	Variance
1. Combined group certificate scheme	36,352	28,817	155,898	223,350	444,417	+17%
2. Mechanisms to sell carbon credits	11,330	5,235	28,106	28,460	73,131	-3%
3. Method for participatory carbon assessment	78,538	87,177	175,602	106,489	447,805	+32%
4. Controlling drivers of deforestation	8,337	0	10,840	40,000	59,177	-58%
5. Benefit sharing best practice	51,925	27,215	52,309	71,837	203,286	-16%
6. Results dissemination	0	4,124	18,622	38,309	61,055	-18%
Capital Costs	100,899	16,536	0	0	117,434	-0%
Staff	69,683	67,960	86,968	88,944	313,555	-10%
Evaluation	0	0	40,000	60,000	100,000	-
Administration	38,415	29,722	26,508	33,618	128,263	-2%
TOTAL	**395,478**	**266,786**	**594,853**	**691,006**	**1,948,123**	**-**

Of the above budget, $200,000 remains a performance-related conditional disbursement for activity 1.6 (Complete PFM expansion to all pilot villages including FSC certification).

The breakdown by cost category is given in the figure below.

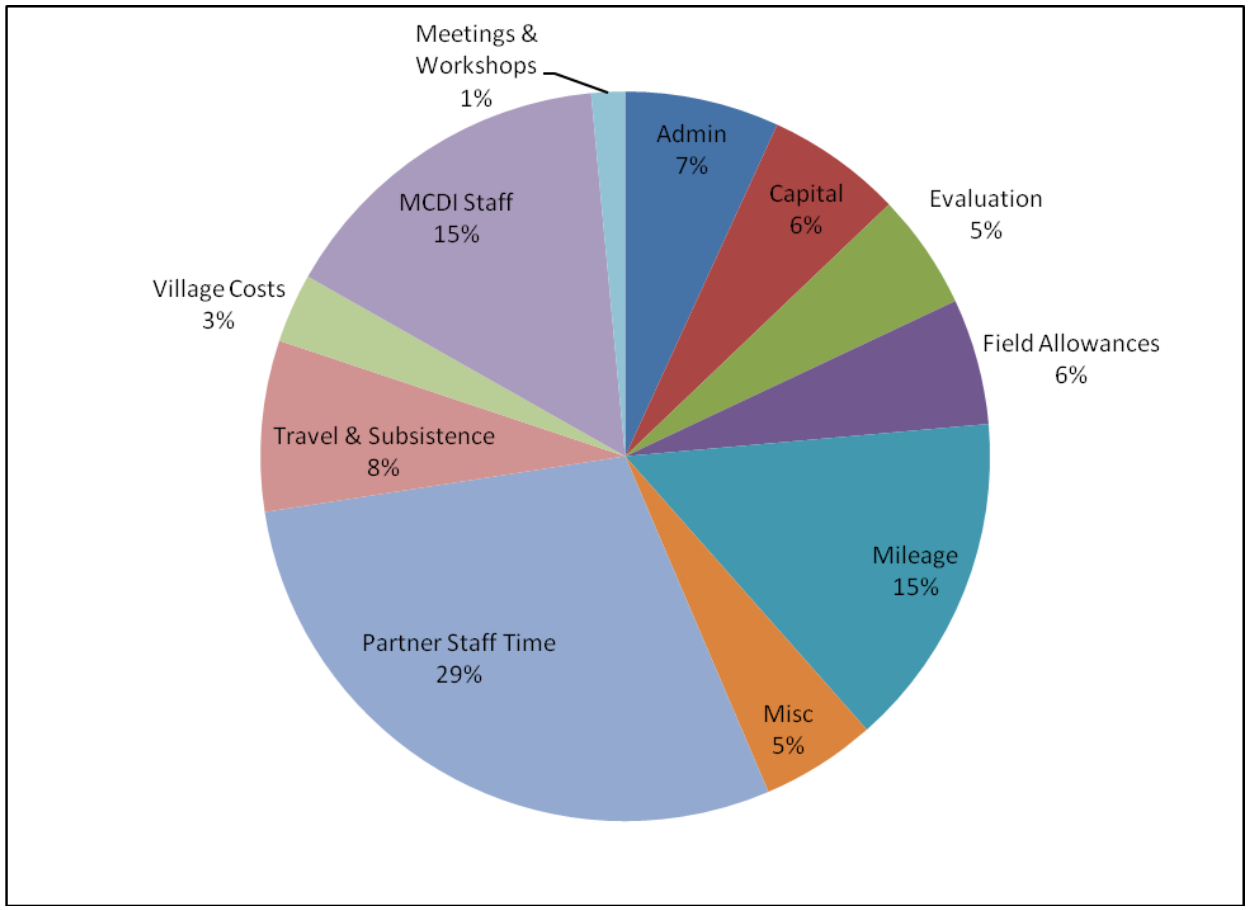

Figure 2. Overall proportion of expenditure by cost category.

The total funds allocated to each partner over the four years are as follows. The figures for External indicate where external expertise is being sought. These are principally the VCS/CCBS validation process and the independent evaluations (mid-term and final).

Partner	Year 1	Year 2	Year 3	Year 4	Total
MCDI	246,018	169,336	233,728	370,561	1,019,643
Carbon Tanzania	17,768	760	24,497	21,547	64,572
Maliasili Initiatives	0	0	12,696	15,706	28,401
University of Edinburgh	60,504	55,532	103,690	85,947	305,673
University College London	0	0	34,500	11,500	46,000
University of East Anglia	44,060	9,855	34,152	47,179	135,245
Fauna & Flora International	27,127	23,093	27,196	11,317	88,734
LTS / Value for Nature	0	8,210	84,394	17,250	109,854
External	0	0	40,000	110,000	150,000
TOTAL	**395,478**	**266,786**	**594,853**	**691,006**	**1,948,123**

Implementation Arrangements

Most implementation arrangements will stay as they currently are. Please refer to the original proposal and subsequent progress reports for details as to how we are working with national and district level government.

One partner listed in the original proposal, Sokoine University of Agriculture proved too busy to become a full partner in this project and never assumed its role in implementing parts of the project. Instead we propose to add two new minor partners to the project with specific technical knowledge in key areas vital to the success of the project.

LTSi / Value for Nature

Under Jan Fehse's leadership LTSi/VfN will design the new VCS methodology and draft the technical sections of the PDD. Jan has spent over ten years working directly on carbon forestry projects in the framework of the Kyoto Protocol's Clean Development Mechanism (CDM) and voluntary carbon standards, being closely involved with project design and formulation, carbon modelling, financial structuring and credit commercialization. He was a reviewer of the first Guidelines for AFOLU projects of the Voluntary Carbon Standard (VCS) and has been selected as a technical expert of the 'VCS Jurisdictional and Nested REDD Initiative'. He has on-the-ground field experience with the technical and scientific aspects of quantification and monitoring of carbon dynamics in forest systems, and in-depth knowledge of the global carbon market and global climate change policy, in particular in relation to the land use, land use change and forestry sector. Jan was founder and first chairman of the Forestry Group of the Carbon Markets and Investors Association, an organization whose members cover an estimated three quarters of transaction volumes in the carbon markets.

University College London (Geography Department)

Professor Phil Lewis's team are long term partners with Mat Williams's team at our existing project partner University of Edinburgh. Prof Lewis's team has specific expertise in monitoring the land surface using remote sensing, with particular expertise in advanced methods for monitoring fire impacts from satellite data and integrating such information into carbon models. They have worked extensively on these issues across southern Africa in collaboration with colleagues in the UK National Centre for Earth Observation (NCEO), the US and South Africa (including SANParks in Kruger National Park). The team at UCL will deliver the burn scar maps which will underpin our analysis of historical fire prevalence in Kilwa over the last ten years.

In addition to the above two new partners, we are also rationalising our existing partnership with **Maliasili Initiatives** (led by Fred Nelson, providing policy analysis inputs) and **Carbon Tanzania** (managed by Marc Baker, providing sales expertise and technical support on biodiversity monitoring, see below). Maliasili Initiatives are a partner of Carbon Tanzania, and the policy analysis support to this project has hitherto been channelled through Carbon Tanzania. However, since the start of this project, Maliasili Initiatives, originally just a consultancy, has been reconstituted as a non-profit based in the USA, and has begun a direct partnership with MCDI, supporting it primarily on capacity building issues. Thus it makes to rationalise this arrangement with Maliasili Initiatives such that they become a full partner in this project. This will have no impact on operational matters, just the routing of project finances.

Sustainability

Stakeholder Engagement

MCDI has a long term commitment to supporting sustainable forestry and rural development in Kilwa District. Thorough and ongoing engagement with local stakeholders is critical to the success of this long term approach. Although MCDI does not expect simply to hand-over its projects at the end of funding, local ownership is crucial to successful adoption and cost-effective implementation. Specifically in this revised project plan communities need to be fully motivated to combat uncontrolled fires and carry out the programme of early burning if we are to achieve the carbon savings for which we are aiming.

Thus throughout the process of developing this proposed project revision MCDI has consulted all relevant partners, especially from our colleagues at Kilwa District Council and community members in the selected pilot villages. Specifically the key ideas were outlined at MCDI's last Annual Stakeholders Forum (held in January 2012) at which feedback and comment were sought from all participants. More detailed input was sought from Kilwa District Council officials, particularly on the tricky issue of refining community carbon agreements. Finally MCDI staff visited the pilot villages of Ngea, Mchakama, Nambondo and Mandawa in which communities' role was thoroughly discussed. Specific feedback from these stakeholders included:

- Communities see early burning as a good practice which can be used by them when clearing their land, and any other fire management such as use of fire for settlement clearance. Previous attempts had not paid proper heed to essential issues such as the correct season and time of day to burn; it will be important that this project follow early burning best practice.
- MCDI should take into consideration emerging new causes of fires from pastoralists who recently immigrated to Kilwa and who use fires to burn grasses and thereby encourage new grass growth for their livestock. Thus pastoralists around participating villages should be educated on the effects of fire and involved in early burning practices where possible.
- Early burning be done late in the evening when there is less wind.
- The width of the burning strip along the VLFR boundary should be as wide as possible (to 100m) to ensure water from the other end doesn't easily get into the forest. (MCDI will decide this after first testing of early burning.)
- MCDI should consider use of herbicides to kill grasses instead of early burning as a fire control measure. However, we responded that this is an expensive solution that can harm biodiversity, and would bring difficulties under our FSC certificate.
- Early burning should start on the side of the forests closest to farming areas or where prevailing winds are most likely bring wild fires. Additional early burns may be appropriate in such areas to provide extra protection to the VLFRs.
- There are different types of grasses found within the forests. Some retain moisture longer than others and/or are partially fire resistant. A single burst of early burning may not be sufficient to entirely clear the fuel load for late season burns. To be investigated with the trial early burning work (activity 4.2).
- Since a lot of fires are associated with slash-and-burn agriculture, we should work closely with the District Agriculture Department on the launch of the early burning programme, for which budget has been set aside. The District Agriculture and Livestock Officer can assist us on educating villagers on best agricultural and land use management practices which in turn will reduce fire frequencies coming from slash and burn agriculture. Political leaders could also be usefully involved in awareness raising.
- Invest more in awareness-raising especially amongst outlying hamlets so that everyone can understand the positive benefits of the project, and the time scales on which these will be

provided. (One misunderstanding is that the 30 year duration of the carbon agreements means communities will not benefit until after 30 years.) Budget allocation has been made specifically to support this.

- Kikole and Mitole leaders invited MCDI to return with the revised carbon agreements once awareness has been raised, optimistic that agreement can then be reached.
- MCDI should complete VLFR demarcation and then development of byelaws which help to enforce lays with regard to fire management at village level. This all falls under PFM development (activity 1.6) with some modifications regards to fire management.
- Communities wanted to check there was sufficient budget set aside (there is) for purchase of forest management gear such as boots and overalls. (There is specific budget for this in activity 1.6.)
- Increase attendance at the annual stakeholders forum, especially from women. MCDI has ensured sufficient budget is there to cover this.
- Initial training provided to villages on good governance could do with further follow-up, with village assemblies often being skipped. We will devise incentive schemes to improve this record, such as linking participation in the Most Significant Change monitoring to Village Assembly attendance, and prizes for villages which score the best in the Village Governance Monitoring programme.

These and all other suggestions have been incorporated into this proposed revision. MCDI's flexible approach and high level of investment in stakeholder engagement will facilitate further adaptations to local conditions should further adjustments be needed.

Risk Analysis

All the risks listed in the original proposal and associated with the original project design still stand:

- International negotiations necessary for the establishment of a regulated carbon market are proceeding slowly and since the project's inception it has become clear that no global compliance market for REDD will exist prior to 2020. These setbacks at the global climate regime level have created considerable volatility in existing carbon markets, augmented by other factors such as the global economic crisis and continuing debt crises in Europe. Nevertheless, some regional compliance markets continue to emerge, notably in the state of California, and over-the-counter (OTC) trade in the voluntary carbon market continues to grow and support substantial investment in REDD in Africa and globally.
- National policy development is still very unclear. However, MCDI's efforts at close engagement with the National REDD Taskforce should help if possible contradictions should start to emerge.
- Land tenure is still threatened by external investors seeking large land areas for agricultural schemes, although recent history has shown such investors rebuffed. The experience with the Dutch biofuels investor, Bioshape, in Kilwa District since 2007 has made both village and district officials increasingly aware of land tenure concerns and wary of allocating large areas of land to commercial investments.
- Village boundary inaccuracies and boundary disputes remain a problem.
- REDD is extremely complex and community misunderstandings are common. MCDI's growing internal capacity, and maturing staff, is helping to mitigate this risk.
- Village expectations nonetheless often race ahead of the capacity to deliver. This and the aforementioned confusions have created space for local political opportunists to cause some difficulties for the project. For the time being these are all under control, but we can have no cause for complacency.

- Village constituents are not always strong enough to hold their leaders to sufficient account, allowing village elites to capture excess benefit from forest revenues. Continued strong community engagement over the coming years will be vital to mitigating this.
- The carbon price is critical to the viability of any project dependent upon selling offsets into the market. Recent prices for exchange traded VCS offsets are not encouraging in this regard, with some selling for under $5 per tonne CO_2e. However, direct sales, such as to companies' Corporate Social Responsibility units is a much more promising avenue, and MCDI's partnership with Carbon Tanzania could well prove critical in securing a good price for the carbon offsets it generates.
- It is now extremely unlikely that we will have sold sufficient credits by the end of the project to begin significant PFM expansion within the funded period, and face a problematic potential funding gap until significant revenues start to accrue in 2015-6. The new design has exacerbated this risk. However, by the end of the project all the necessary systems should have been established such that all stakeholders can be confident that this important outcome can be realised subsequently.
- MCDI's small team remains vulnerable to departures of key staff, such as happened with the REDD Coordinator MCDI recruited in 2010. MCDI is now focusing on developing its junior staff capabilities to fulfil an ever greater proportion of the various project tasks, substantially mitigating this risk, and boding well for the long term future of MCDI.

Four new significant risk factors have been introduced or substantially altered with this new project design. These are explained below.

Can we successfully implement Community-Based Fire Management?

Fire management programmes have a mixed record of success at best within East and Southern Africa. However, many such programmes that have struggled are based around protected areas, and thus in a context of confrontation between local people and PA managers where the challenge essentially revolves around government PA managers attempting to prevent burning events caused by local resident people. For example, MCDI's partner FFI are advisers to the management of Niassa Reserve in northern Mozambique, and have also investigated fire management options with regards to carbon markets. There, however, they are pessimistic of success due to local hostility to the existence of the reserve which constrains local livelihood opportunities. In contrast, MCDI's work in Kilwa is founded upon a high level of trust between our staff and the communities we support. This trust has been built up over many years, and bolstered by actual revenues earned by communities from their forests. Communities trust that, by and large, MCDI is on their side, will be there for the long haul, and is ready to respond flexibly to their issues and concerns, and to help where we can.

Launching the programme will thus still be a significant logistical challenge, but we have the right foundations to work from. We can generally expect the communities to work with us rather than actively undermine efforts. Moreover, local people regularly use fire in a broad range of activities. They are experienced in its use and understand intuitively how bush fires behave. Thus the early burning programme will require little in the way of education, and more just a channelling of energies combined with appropriate quality assurance checks to ensure a thorough job has been done.

A related risk is that leakage, expected to be negligible, instead reaches non-trivial levels as could happen in the baseline Fire Return Interval comes out at more than 2 years, or as a result of cultural or lifestyle factors that have not been fully incorporated into our understanding. This will be evaluated on an ongoing basis through the control plots, and the project adapted accordingly if necessary.

Will the fire management programme lead to significant changes in forest carbon stocks?

UoE's model of change is fundamentally sound, and has been supported by other fire experts that we have talked to. Nonetheless it is also clear that specific predictions of their model are not borne out in Kilwa, and the model needs significant adjustments to reflect the reality of what we see in Kilwa. This is not surprising because the model is as yet crude and based on only a few fire experiments further south

in Africa. The relatively few data points in their model forced us to put a lower limit of zero in our estimations of carbon losses due to fire (see Reason for the Revision above) when we do not believe that should be the case. Overall we are all, including UoE, substantially more convinced by the conceptual and empirical underpinnings of the project than specific features of UoE's current model.

We thus have little doubt that this programme of fire management will lead to higher carbon stocks in the forest, but the question is how much and over what period of time? These are questions that we cannot answer until we implement the project. Individual fire experiments are difficult and costly, and usually cover only relatively small areas of forest; even running such an experiment for ten years in Kilwa before launching this project would give us only limited insight to the likely results. This project thus has substantial value as a large scale controlled experiment in the effects of early burning on dry forests in East and Southern Africa, and arguably represents value for money purely on that basis.

Although we anticipate annual changes of 0.5-1tC/ha in aboveground biomass, depending on a reasonable carbon price (~$8 and upwards) the project should be feasible with carbon stock changes as low as 0.25tC/ha per year. Thus there is room for error in our projections without entirely jeopardising the project. And even should the changes anticipated fail to materialise the lessons learned about fire management in dry forests in the tropics should be well worth the investment.

Can we effectively measure such changes in carbon stocks?

At the lower end of expectations (see above), we may be looking for changes in stem biomass of around 1% per year. This will be difficult to measure and distinguish from natural fluctuations. Data already gathered allows us to estimate exactly how difficult. This statistical power analysis will underpin the design of the monitoring programme, so that we minimise such risks. However, increasing monitoring effort increases costs. Unusually for a REDD+ initiative this project is likely to have higher monitoring costs than direct implementation costs.

One obvious solution to this quandary is to reduce the periodicity of monitoring. Assessing biomass carbon only every three years would reduce costs by two-thirds and mean that we would be searching for carbon stock changes of between 3% and 30%, which is significant easier. (Two and four year options are also under consideration. Aggregation of carbon offsets across multiple forests will also reduce uncertainty.) The one downside of this approach is that it delays initial revenues from the project, meaning MCDI will be dependent upon some kind of external support to meet this cash flow shortfall for roughly the first five years of the project's operational time span.

Can we meet international carbon market standards?

The original proposal also envisaged developing our own VCS methodology, so this element is not new. However, because the approach being taken is so different, the new methodology will be able to draw less upon existing approved methods, and instead propose entirely new approaches (within the context of the carbon markets). This carries significant risks – in needing to pass the VCS double approval process – but also has the significant advantage of allowing us to tailor the methodology to exactly our needs. (This compares with some other REDD pilot projects in Tanzania that have struggled to meet criteria set down in the VCS method, despite otherwise having a worthy project design.) Indeed the relevant sections of the Project Design Document – the critical management document that underpins third-party validation – will be drafted in lock-step with the methodology to ensure we can meet the various requirements we propose. That said, we will also endeavour to make our new methodology as broadly applicable as possible so as to make it more widely useful upon project completion.

In order to minimise the risks around methodological approval we are partnering with an expert in the process – Jan Fehse from Value for Nature – who understands exactly the requirements to succeed with VCS approval. It is also notable that the whole VCS method approval process has speeded up substantially within the last couple of years such that we are optimistic of completing this entire process within one year.

Impacts on Biodiversity

Long Term Changes

With its explicit aim to increase carbon stocks this project can be classified as a habitat restoration initiative; in this case, restoring the ecosystem to something closer to when human population densities were much lower and anthropogenic fires significantly rarer. By definition we would expect to see a significant shift in species composition, although many such shifts will take many years to complete. As the conserved areas shift from savannah to woodland and from woodland to forest those species which prefer more open habitats are likely to decline at the expense of those which favour closed forests.

Restoration normally implies that species composition shifts are actively desired, and thus not something requiring mitigation. Most rare and endemic species found in Kilwa are associated with the denser East African Coastal Forests with the exception of a few large mammals, such as kudu and African wild hunting docs, which favour savannah woodland complexes, and which are primarily seasonal visitors from the populations in the greater Selous-Niassa ecosystem. Hence the balance of species composition changes are likely to increase rather than decrease biodiversity. Nonetheless it will be important to monitor such changes over time so as to inform management in case significant deleterious impacts should be observed.

The challenge with such long term monitoring is separating out multiple causative variables. For instance some form of climate change is now believed inevitable. To what extent are changes subsequently observed a result of climate change or the fire management regime? Such questions cannot easily be answered with control sites because spill-over effects are much more likely with biodiversity than with simple biomass, especially for the larger, more mobile, mammalian and avian fauna which are more easily monitored. In contrast to the better studied and less diverse ecosystems of the temperate zones, we simply do not know enough about the ecology of tropical biomes to correctly interpret many monitoring results, which often leave us with more questions than answers.

That said, MCDI's existing community-based monitoring scheme is already well suited to simple longitudinal monitoring of the anticipated changes. The selected indicator bird species were chosen as proxies for high quality forest, and thus we can expect their numbers to go up. One or more species which are proxies for more open woodland, especially grass nesters, could usefully be added to complement this approach. The various indicators of large mammal presence which are currently collected by communities will provide a broader view of long term ecosystem compositional changes.

In addition to this we will investigate the potential to monitor biodiversity indicators amongst less mobile invertebrates and/or local flora in the permanent sample plots established to track changes in biomass in and outside the community forests subject to controlled burns. Leveraging in this way these monitoring plots, which are already required, will both help to control costs and also ensure that we have complementary data with which to help interpret monitoring results.

Immediate Impacts of Early Burning

Miombo is a fire-adapted ecosystem, and many species are fire tolerant to at least some degree. Fires lit early in the dry season will be cooler and thus a shift towards this kind of fire management is likely to favour those species which are less fire tolerant. However, the timing of burns is also important, e.g. for those bird species which nest on the ground. Should early burning coincide with one or much ecologically critical processes it could disrupt them and threaten the species involved. This threat, though, will be substantially mitigated by the patch-work burning approach in which only a portion of the forest is burned each year (except for the boundary strips). The timing of burns may particularly influence species compositions amongst herbaceous plants, e.g. the grasses which make up a significant proportion of the fuel load.

In order to better understand these risks we will undertake two activities:

a. Assess, so far as possible given the current state of knowledge of miombo ecology, which species may or may not be especially susceptible to such fire timing issues.

Ethnobiological enquiries with local hunters may help to identify some species and suitable indicators for future monitoring.

b. Conduct trial experiments assessing before and after (~1 week before and ~1 week after) surveys of reptiles and amphibians around both early and late burns to investigate the differential effects on these less mobile taxa. Results however may be very difficult to interpret: there is a significant likelihood that the vegetation structural changes, especially increased visibility, following a fire substantially alters the detectability function of species of interest.

Together these shall inform the development of a robust long term monitoring plan.

Replicability

Once established, the proposed project should become a self-sustaining scheme which pays for its own expansion, thus eventually delivering significant economies of scale. By working with forest adjacent communities and ensuring the bulk of the benefits flow to these communities, we will provide a strong incentive for them to look after the forests and deliver the carbon savings which lie at the heart of REDD. Since permanence is achieved through timber rents, and REDD payments only used to cover the costs of expansion, the scheme will deliver much greater long term benefits for the same value of carbon credits than alternatives.

The project itself should be directly replicable in other districts in south-eastern Tanzania with substantial timber stocks. Beyond that major elements should be replicable across the Miombo belt of east and southern Africa (some 2.8 million km^2), and more broadly across tropical dry forest ecosystems. The new VCS method will be accessible to anyone wishing to fund fire management in such ecosystems via the carbon markets. Finally the fundamental lessons of how to organise a community-based fire-management project and how to effectively monitor impacts of fire in dryland forests will be valid around the world.

Appendix I : Revised Logical Framework

Changes to this logical framework from the original proposal are highlighted in red for ease of reference (deletions are not shown).

Project Summary	Measurable Indicators	Means of Verification	Important Assumptions
GOAL: Institutions and selected local communities in South Eastern Tanzania are REDD ready by 1st January 2014			
PURPOSE: Pilot the integration of new financial flows from carbon offsetting activities under REDD with PFM and forest certification, leveraging these revenues as a catalyst to further expand sustainable forest management and use in SE Tanzania.	28, 000tCO_2e saved and first *ex-ante* offsets sold by end of project; mechanisms for transparent management of sales established. New methodology for delivering REDD+ credits through fire management. 80% of PFM profits benefitting local people, and 66% of community members favourable towards PFM and REDD. PFM expansion underway funded by REDD revenues with another 25,000ha of forest and seven rural communities (~10,000 people) into MCDI's FSC group certificate by end of project.	Receipts issued for carbon credits. Project records and reports.	Mechanisms established for the voluntary market can be adapted to the regulatory market. REDD revenues suffice to begin expansion. Methods developed are applicable beyond the project pilot area.
OUTPUTS: 1. Combined group certificate, validation and verification scheme covering timber and carbon-based products open to widest possible variety of community-managed forests in Tanzania.	Combined group certificate including third party validation of carbon benefits of project. New VCS-approved methodology made available for generating REDD+ credits through fire management.	Certificates obtained. VCS and CCBA records. Project records and reports.	Certified scheme attracts buyers on the international voluntary market.
2. Mechanisms to sell carbon credits for expansion of group certificate and/or forest recovery, and compatible with developing national REDD standards.	Sales system established and compatible with national approaches. Website for transparent sales management established. First *ex-ante* offsets sold by end of project.	Receipts issued for carbon offsets. Functioning website. Project records and reports.	Sales of offsets eventually suffice to fund PFM expansion. Project design and web-based sales mechanism are compatible with new national standards.

Project Summary	Measurable Indicators	Means of Verification	Important Assumptions
3. Efficient, scientifically robust and cost-effective method for participatory assessment and monitoring of carbon stored in forests including soil carbon.	Method for participatory C assessment developed and trialled. New method requires less than half time investment of current method. Protocol for verification of C assessments by remote sensing developed and trialled. Combined method is able to estimate C stocks to 75% confidence level.	Carbon assessment records submitted to 3rd party certifier. Project records and reports. Published journal papers.	Method is acceptable to 3rd party certifier. Carbon assessments show sufficient carbon to generate substantial revenues from REDD. GIS data analysis is sufficiently simple that it can be systematized.
4. Drivers of deforestation controlled and reduced.	Analysis of local drivers of deforestation. Programme for control of significant drivers designed and implemented.	Carbon assessment records submitted to 3rd party certifier. Project records and reports. Published journal papers.	Analysis of drivers of deforestation remains valid in the short to medium term; significant new threats do not emerge.
5. Best practice established for equitable management and sharing of economic benefits from forest conservation across the entire community.	At least 50% of community members receive material or in-kind benefits equal to at least 10% of their annual income by end of project.	Socio-economic surveys of households in participating communities. Feedback collated through Most Significant Change system. Project records and reports. Published journal papers.	Community benefits are sufficient to attract continuing support for PFM and REDD.
6. Achievements disseminated with policy recommendations for national and international audiences.	Methods and best practice documented and disseminated based on project experiences. Annual policy analyses published with recommendations.	Published analyses. Project records and reports. Published journal papers.	Recommendations are well-received and acted upon.
ACTIVITIES: 1.1. Preliminary policy analysis and detailed scheme outline.	Policy analysis and outline produced within 6 months of project commencement.	Report submitted to RNE and REDD Taskforce.	Scheme can be put into action without encountering policy blockages.
1.2. Sign carbon agreements with selected pilot communities.	Carbon agreements signed with all pilot villages.	Signed agreements in village and KDC records.	Communities adhere to their responsibilities as outlined in the agreements.
1.3. Develop REDD Project Design Document.	First full draft complete by end Y3.	Draft submitted to RNE and REDD Taskforce.	Design is compatible with 3rd party certification standards.

Project Summary	Measurable Indicators	Means of Verification	Important Assumptions
1.4. Achieve carbon validation to industry-leading voluntary market standards (VCS and CCBA).	MCDI receives 3rd party carbon validation by end Y4.	Certificates held by MCDI. 3rd party certifier records.	Validation can be successfully maintained and leads to saleable carbon credits.
1.5. Confidence-building preliminary steps to PFM including land-use planning.	VNRCs formed in all pilot communities by end Y2. Village Land Use Plans completed in all pilot communities by end Y2.	Village and KDC records.	Steps lead to full PFM and FSC certification later.
1.6. Complete PFM expansion to all pilot villages including FSC certification.	Have at least 10 villages inside combined group certificate scheme by end of the project.	3rd party certifier records. MCDI group certificate records.	Expansion does not overstretch MCDI's management capacity.
1.7. Monitor participatorily avifauna biodiversity and threats to biodiversity in community forests.	Estimated population counts of indicator species. TRA scores for each VLFR.	Project records and reports. 3rd party certifier records.	Indicators show positive, or at least non-negative trends, supporting sales of carbon credits.
1.8. Design new VCS method and support it through the double approvals process.	New VCS method approved by mid Y4.	VCS list of approved methods.	MCDI can successfully implement the new methodology.
2.1. Participate in development of national standards and systems for sales, monitoring, assessment, reporting and verification of carbon credits.	One or more project partners present in at least 75% of relevant national meetings and workshops.	Meeting minutes and workshop proceedings reports.	Project partners listened to, and views taken on board where appropriate.
2.2 Establish all necessary systems to comply with national REDD standards as they evolve.	MCDI ready to comply with national REDD standards by end of project.	Project records and reports.	National REDD standards are completed by end of project. Standards are not incompatible with project design.
2.3. Develop market linkages through Carbon Tanzania and international carbon exchanges.	At least some credits sold by end of project.	Receipts issued for carbon credits. Project records and reports.	Markets accessed are sufficiently large to fund expansion.
3.1. Assess stem and root biomass carbon in miombo woodlands in SE Tanzania.	Baseline assessment produced inc confidence limits by end Y2.	Project records and reports. Published journal papers.	Variability in stem and root C stocks manageable.
3.2. Assess soil carbon in miombo woodlands in SE Tanzania.	Baseline assessment produced inc confidence limits by end Y3.	Project records and reports. Published journal papers.	Variability in soil C stocks manageable.

Project Summary	Measurable Indicators	Means of Verification	Important Assumptions
3.3. Develop participatory method for assessing biomass.	Method developed and trialled by end Y4. Results published.	Project records and reports. Published journal papers.	Community members are able to use method unsupervised for future monitoring of C stocks.
3.4. Monitoring effects of fire on forest biomass and carbon balance.	Method refined and tested by end of project. Results published.	Project records and reports. Published journal papers.	Community members are able to use method unsupervised for future monitoring of C stocks.
3.5. Spatial analysis of regional biomass by fusing remote-sensing satellite data with ground surveys.	Results of analysis against biomass carbon published by end Y3.	Project records and reports. Published journal papers.	Remote-sensing data has sufficient resolution to generate meaningful results.
3.6. Develop simple and efficient protocol to allow for remote verification of participatory carbon monitoring.	Protocol developed and trialled by end Y4.	Project records and reports. Published journal papers.	Remote-sensing data has sufficient resolution to generate meaningful results.
4.1. Analysis of local drivers of deforestation.	Thorough, participatory analysis completed by end Y1.	Report submitted to RNE and REDD Taskforce.	Drivers of deforestation are susceptible to intervention.
4.2. Design programme for community-based fire management in community forests.	Programme design completed and trialled in at least one community forest by end Y3.	Design set out in draft PDD.	Programme can be successfully rolled out (not too manpower intensive for MCDI).
4.3. Implement community-based fire management in community forests.	Programme has commenced in at least 4 villages by end Y4.	Project records and reports. Village records.	Programme successfully controls fire in community forests.
5.1. Identify and test best methods for participatory poverty assessment.	At least 2 different methods for participatory poverty assessment trialled in pilot villages by end Y1.	Report submitted to RNE and REDD Taskforce. Published journal papers.	Participatory methods yield meaningful results.
5.2. Pilot protocol for best financial management at village level with mechanisms to deliver democratic benefit sharing, with benefits felt across the community.	Protocol developed, trialled and documented by end Y2. At least 50% of community members experiencing benefits by end of project.	Report submitted to RNE and REDD Taskforce. Published journal papers.	Communities cooperate willingly, and take up protocol for long term use.
5.3. Develop methods and establish baseline for participatory assessment of village governance.	Method trialled and documented, and governance scores produced by end Y1.	Report submitted to RNE and REDD Taskforce. Published journal papers.	Assessments encourage better governance by community leaders.
5.4. Monitor changes in village governance.	Annual governance scores produced in Y2-Y4. Audit of PFM revenues received to date in Y3.	Project records and reports. Published journal papers.	Assessments encourage better governance by community leaders.

Project Summary	Measurable Indicators	Means of Verification	Important Assumptions
5.5. Monitor households' socio-economic status over length of project.	Results of biannual surveys reported in Y1, Y3 and Y4.	Project records and reports. Published journal papers.	Household indicators show measurable change over project duration.
5.6. Monitor communities' perceptions of project progress and impact on their lives.	Stories of change collected from each participating village.	Project records and reports.	Community members supply representative stories which honestly reflect changes experienced.
6.1. Publish annual policy analyses throughout life of project.	Analyses produced each year.	Analyses submitted to RNE and REDD Taskforce.	Analyses are useful in informing development of national REDD standards.
6.2. Document achievements and methods developed, and disseminate to national and international audiences.	Separate reports on each output by end of project. At least 3 journal papers submitted for publication and presented at conferences.	Reports submitted to RNE and REDD Taskforce. Published journal papers.	Methods and protocols developed are usable by other projects.
6.3. Knowledge on carbon assessment transferred to Tanzanian partners.	At least 2 MCDI staff trained in advanced carbon assessment techniques and analysis.	Report on training workshop.	Staff trained continue to work on REDD activities within Tanzania.
6.4. Final report compiling all policy recommendations together with methods, experiences and lessons learned from pilot project.	Comprehensive final report summarising all project components, results achieved, lessons learned, and policy recommendations produced by end of project.	Report submitted to RNE and REDD Taskforce.	Report is useful to other REDD practitioners.

Appendix II: Impact & Milestones

Impact and Output Indicators

The table below sets out updated annual project milestones for each impact and output indicator with changes highlighted in red.

Indicator	Year 1	Year 2	Year 3	**End of Project Target**
Impact Indicators *(cumulative)*				
CO_2e saved against baseline				28,000t
Forest area under PFM	25,000ha	25,000ha	30,000ha	50,000ha
% of PFM profits spent to the benefit of local people	35%	50%	65%	80%
Villages / rural people benefiting from PFM	4 villages / 6,000 people	4 villages / 6,000 people	6 villages / 9,000 people	12 villages / 18,000 people
% people in participating communities with positive view of PFM and REDD	40%	50%	60%	66%
Output Indicators				
1. Third party certification and verification of carbon.	Baseline deforestation scenario determined. Carbon agreements with communities.	Project Design completed.	VCS methodology written and submitted. PDD early draft complete.	Third party carbon certification achieved.
2. Mechanisms to sell carbon offsets.			Marketing strategy written.	Website for transparent sale of carbon offsets established. Possible first advance sales.
3. Methods for participatory assessment and monitoring of carbon stocks inc verification by remote sensing.	PSPs established. Preliminary estimates for AG biomass carbon.	Baseline estimates of AG biomass carbon. Participatory method for assessing biomass carbon developed.	Carbon assessment method approved by VCS. Baseline estimates of soil C. First estimates of biomass accumulation rates.	Published estimates of total C content, plus rates of loss and accumulation. Published methods for participatory assess-ment of biomass carbon, and for using remote-sensing data to validate partici-patory C monitoring.
4. Drivers of deforestation controlled and reduced.	Analysis of local drivers of deforestation. Business plan to tackle them.		Community Fire Management programme designed.	Community Fire Management programme rolled out to all pilot villages.
5. Economic benefits experienced throughout participating communities.	Baseline socio-economic assessment at household level.		Audit of PFM revenue received thus far.	>50% of households benefiting from PFM to at least 10% of annual income.
6. Achievements disseminated with policy recommendations.	Annual policy brief and report on results achieved.	Annual policy brief and report on results achieved.	Annual policy brief and report on results achieved.	Comprehensive policy brief and report on results achieved.

Key Milestones

There follows a comprehensive and detailed list of key project milestones.

Milestone	Description (target date to be achieved)	Means of Verification
Baseline deforestation scenario determined	A generic baseline (zero intervention) scenario setting out background rates of forest loss researched, documented and agreed with stakeholders. (Y1)	Project report
Carbon agreements with communities	Agreements reached with communities already in FSC certificate for MCDI to sell carbon credits in return for ongoing free support from MCDI. (Y1)	Signed agreements
VCS methodology written	New methodology submitted to VCS double approval process. (Y3)	VCS records
PDD drafted	A first complete draft of the Project Design Document setting out how carbon savings will be made against the baseline scenario, and describing how co-benefits such as biodiversity and rural development will be delivered. (Y3)	Draft PDD circulated to stakeholders
VCS methodology approved	All concerns raised by VCS assessors addressed and revised methodology approved for implementation. (Y4)	VCS records
Third party carbon certification achieved	Validation by the internationally respected carbon standards organisations VCS and CCBA. (Y4)	Certifier records
Marketing strategy	Strategy for marketing voluntary carbon offsets through over-the-counter sales.	Project report
Website for transparent sale of carbon offsets	Innovative website to provide full two-way, spatially explicit transparency on offsets sold.	Functioning website
Baseline estimates of AG biomass carbon	A completed baseline estimate of above-ground carbon in biomass found in Kilwa. (Y2)	Project report
Participatory method for assessing biomass carbon designed	Method for participatory assessment of biomass carbon designed and trialled. (Y4)	Project report
Analysis of local drivers of deforestation.	Detailed and participatory analysis of local drivers of deforestation, including charcoal and shifting cultivation, together with estimates of the potential carbon leakages. (Y1)	Project report
Baseline socio-economic assessment at household level	Baseline survey of households in pilot area villages, assessing wealth (tangibles and intangibles). (Y2)	Project report
Audit of PFM revenue received thus far	Detailed audit of PFM revenue received by villages by this point, and how it has been spent. (Y3)	Project report
Annual policy brief and report on results achieved	At the end of every year the project partners will produce a report setting out major achievements made, and any policy recommendations that arise from the work done.	Published reports

Carbon and Revenue Projections

Our median project scenario is for monitoring every three years and a carbon retail price of $5 per tonne CO_2e. Based upon this scenario our model envisages the following project emissions reductions with a staggered expansion over ten years.

Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Project area (cumulative ha)	16,000	24,000	24,000	24,000	24,000	32,000	32,000	32,000	44,000	44,000
Net emission reductions/ha	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81
				Total Net Emission Reductions (TNER)						
Starting 16,000ha	28,893	28,893	28,893	28,893	28,893	28,893	28,893	28,893	28,893	28,893
Next 8,000ha		14,447	14,447	14,447	14,447	14,447	14,447	14,447	14,447	14,447
8,000ha added in Y6						14,447	14,447	14,447	14,447	14,447
12,000ha added in Y9									21,670	21,670
TOTAL	28,893	43,340	43,340	43,340	43,340	57,786	57,786	57,786	79,456	79,456
				Emission Reductions Detectable from Monitoring						
Starting 16,000ha			86,679			86,679			86,679	
Next 8,000ha				43,340			43,340			43,340
8,000ha added in Y6								43,340		28,893
12,000ha added in Y9										43,340
TOTAL	0	0	86,679	43,340	0	86,679	43,340	43,340	86,679	115,572
Less Buffer Discount			*24,270*	*12,135*		*24,270*	*12,135*	*12,135*	*24,270*	*32,360*
Claimable Credit Volume	**0**	**0**	**62,409**	**31,204**	**0**	**62,409**	**31,204**	**31,204**	**62,409**	**83,212**

Table 3. Projected emissions reductions and credits claimable from first ten years of scheme operation. All figures tCO_2e.

This in turn would generate the following revenue flows.

Year	1	2	3	4	5	6	7	8	9	10
Revenue from carbon sales		0	312,045	156,022	0	312,045	156,022	156,022	312,045	416,059
Costs										
Implementation costs	9,600	14,400	14,400	14,400	14,400	19,200	19,200	19,200	26,400	26,400
Management costs	45,000	45,000	45,000	45,000	45,000	51,962	51,962	51,962	60,930	60,930
Monitoring costs			41,000			47,343			55,514	
Verification costs			15,000	10,000	10,000	15,000	10,000	10,000	15,000	10,000
Broker share @ 8%			24,964	12,482		24,964	12,482	12,482	24,964	33,285
VCS credit issuance and registry costs			9,361	4,681		9,361	4,681	4,681	9,361	12,482
Cash flow	-54,600	-59,400	162,320	69,460	-69,400	144,215	57,698	57,698	119,875	272,963
Cumulative Cash flow	-54,600	-114,000	48,320	117,779	48,379	192,595	250,293	307,991	427,867	700,829
Less cost of added villages					*-100,000*			*-150,000*		*-150,000*
Balance	**-54,600**	**-114,000**	**48,320**	**117,779**	**-51,621**	**92,595**	**150,293**	**57,991**	**177,867**	**300,829**

Table 4. Projected revenue flows from first ten years of scheme operation. All figures in USD.

At a 5% discount rate this yields a net present value of $470,000.

We have similarly calculated the TNER and NPV of the project under alternative scenarios. $3.25 per tonne of CO_2e is the rough break-even price for the project.

Monitoring interval (years)	**2**			**3**			**4**		
Price ($/t$CO_2e$)	**3.25**	**5**	**10**	**3.25**	**5**	**10**	**3.25**	**5**	**10**
Total Net Emission Reductions up to year 10 (tCO_2e)	418,949	563,414	1,849,153	418,949	534,521	1,300,186	418,949	520,074	953,469
Project Size in year 10 (ha)	24,000	48,000	324,000	24,000	44,000	200,000	24,000	44,000	104,000
Total cumulative cash earned up to year 10 ($)	-15,475	745,021	8,233,778	-9,614	700,829	6,061,506	49,466	709,232	4,720,233
Net Present Value ($ @ 5% discount - government)	-24,162	513,488	5,542,191	-26,523	469,630	4,004,320	-475	448,451	3,028,322
Net Present Value ($ @ 15% discount - commercial)	-29,390	268,062	2,739,151	-41,641	223,993	1,901,812	-44,886	184,121	1,353,011
Cash balance in year 10 ($)	-15,475	445,021	3,633,778	-9,614	300,829	3,611,506	49,466	459,232	3,720,233

Table 5. Comparison of total emissions reductions and cash value after ten years under different project scenarios.

Appendix III: Implementation Plan

The schedules below assumes contracts are signed late 2009, and the project kicks off beginning 2010, running until end 2013.

Indicative Implementation Schedule

Period	Output	Activities
2012 Q1	All	Project revision; strategic planning
	2	Sales strategy development; continued participation in development of national standards and processes
	3	Biomass data analysis
	5	Socio-economic baseline data analysis; MSC monitoring
	6	2011 Policy Analysis; annual MCDI Stakeholders Forum
2012 Q2	1	Complete revision of 'community carbon agreements' supported with additional awareness-raising; finalise exact VLFR allocations; commence VCS method drafting; biodiversity monitoring plan wrt impacts of fire
	2	Continued participation in development of national standards and processes
	3	Power analysis; commence burn scar analysis; commence analysis of radar data
	4	Trial early burning
	5	MSC monitoring
	6	Joint regional workshop with TFCG contrasting and comparing different REDD project approaches
	All	Independent mid-term review
2012 Q3	1	Continue VCS method drafting; commence PDD drafting; establish biodiversity monitoring baseline; commence demarcation of VLFR boundaries, VLFR management plan and byelaw drafting in REDD villages
	2	Continued participation in development of national standards and processes; sales web-site development
	3	Determine location of all additional biomass monitoring plots required and commence plot establishment; complete burn scar analysis; continue analysis of radar data; estimate woody biomass accumulation rates
	4	Commence drafting early burning management plan
	5	Audit of village PFM revenue; MSC monitoring
2012 Q4	1	Complete and submit VCS method for approval; complete PDD first draft; complete demarcation of VLFR boundaries, VLFR management plan and byelaw drafting in REDD villages; biodiversity monitoring
	2	Continued participation in development of national standards and processes; sales web-site development
	3	Continue biomass monitoring plot establishment; test radar predictions of woody biomass; estimate expected biomass degradation rates in project area with uncontrolled burning; draft method for participatory (i.e. community led) assessment of aboveground biomass carbon
	4	Complete early burning management plan
	5	Village governance monitoring; MSC monitoring
	6	Annual report / policy analysis; progress workshop with local stakeholders
2013 Q1-2	1	Respond to comments on proposed VCS method, leading to approval; finalise PDD; pass all VLFR management plans and byelaws through Kilwa District Council; biodiversity monitoring
	2	Continued participation in development of national standards and processes; sales web-site development completed

Period	Output	Activities
	3	Complete biomass monitoring plot establishment; construct biomass maps across the project area using all available sources
	4	Roll-out early burning programme
	5	MSC monitoring
	6	Training on technical carbon assessment skills for local staff
2013 Q3-4	1	Achieve VCS and CCBA validation; inventory new VLFRs for timber and complete harvesting plans; biodiversity monitoring
	2	Continued participation in development of national standards and processes; first sales of *ex-ante* offsets
	3	Revisit original monitoring plots; analyse carbon stock changes; prepare papers for publication
	4	Derive lessons learned from first full year of early burning
	5	Monitor village governance and socio-economic variables; report on results and prepare papers for publication
	6	Final report / policy analysis, wrap-up workshop with local stakeholders
	All	Final evaluation

Gantt Chart

ID	Task Name	Start	Finish
1	Project revision / strategic planning	Mon 02/01/12	Fri 30/03/12
2	Sales strategy development	Mon 02/01/12	Fri 30/03/12
3	Revise carbon agreements	Mon 02/04/12	Fri 29/06/12
4	Biomass data analysis	Mon 02/01/12	Fri 30/03/12
5	Power analysis	Mon 02/04/12	Mon 30/04/12
6	RADAR data analysis	Tue 01/05/12	Thu 27/09/12
7	Participatory C assessment method	Mon 01/10/12	Fri 30/11/12
8	Biomass accumulation rates	Mon 02/07/12	Fri 28/09/12
9	Biomass degradation rates	Mon 01/10/12	Fri 30/11/12
10	Burn scar analysis	Mon 02/04/12	Thu 27/09/12
11	VLFR locations	Mon 02/04/12	Fri 29/06/12
12	PSP locations	Mon 02/07/12	Tue 31/07/12
13	PSP establishment	Wed 01/08/12	Wed 27/02/13
14	Biomass maps	Thu 28/02/13	Mon 29/04/13
15	Trial early burning	Tue 15/05/12	Fri 13/07/12
16	Early burning protocols	Tue 17/07/12	Mon 31/12/12
17	VCS method drafting	Tue 03/04/12	Fri 30/11/12
18	VCS method submission	Mon 03/12/12	Mon 31/12/12
19	VCS method revision	Wed 02/01/13	Fri 29/03/13
20	Biodiversity monitoring plan	Mon 02/04/12	Fri 29/06/12
21	Biodiversity baseline	Tue 03/07/12	Mon 31/12/12
22	PDD drafting	Wed 04/07/12	Fri 29/03/13
23	PDD finalisation	Mon 01/04/13	Fri 28/06/13
24	3rd party validation	Mon 01/07/13	Mon 30/09/13
25	Rollout early burning	Mon 13/05/13	Fri 12/07/13
26	VLFR mgmt plans	Tue 03/07/12	Mon 31/12/12
27	VLFR approval	Wed 02/01/13	Fri 29/03/13
28	Inventory new VLFRs	Mon 01/07/13	Fri 29/11/13
29	C offsets sales website	Tue 03/07/12	Mon 31/12/12
30	First C offset sales	Wed 02/10/13	Tue 31/12/13
31	Revisit original PSPs	Mon 01/07/13	Mon 30/09/13
32	Analyse C stock changes	Wed 02/10/13	Tue 31/12/13
33	Socio-economic data analysis	Mon 02/01/12	Sat 31/03/12
34	Audit of village PFM revenue	Mon 02/07/12	Fri 28/09/12
35	Village governance monitoring	Tue 02/10/12	Mon 31/12/12
36	Household repeat surveys	Mon 01/07/13	Mon 30/09/13
37	Village governance monitoring	Mon 01/07/13	Mon 30/09/13
38	Socio-economic conclusions	Wed 02/10/13	Tue 31/12/13
39	MSC monitoring	Mon 02/01/12	Mon 30/12/13
40	Contribute to national policy debates	Mon 02/01/12	Mon 30/12/13
41	Technical C assessment training for TZ staff	Mon 03/06/13	Fri 14/06/13
42	Policy Analysis 2011	Mon 02/01/12	Fri 30/03/12
43	Policy Analysis 2012	Sat 01/12/12	Thu 31/01/13
44	Annual stakeholder's forum	Mon 02/01/12	Tue 31/01/12
45	Regional comparison workshop with TFCG	Fri 01/06/12	Fri 29/06/12
46	Annual stakeholder's forum	Mon 03/12/12	Mon 31/12/12
47	Wrap-up workshop	Fri 01/11/13	Fri 29/11/13
48	Final reports	Sun 01/12/13	Tue 31/12/13