FCPF Carbon Fund Methodological Framework Discussion Paper #6: Risk of Reversal (Permanence)

WORKING DRAFT SOLELY FOR INPUT INTO AND DISCUSSION BY CARBON FUND WORKING GROUP

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This paper is a work product of independent consultants, managed and revised by the FCPF Facility Management Team and World Bank staff, and does not reflect the opinion of the World Bank

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About this document: The FMT commissioned the development of this series of about a dozen topic-specific Discussion Papers (also known as "Issue Papers") to serve as a common starting point for discussion on the Methodological Framework (MF). The Papers were circulated January-April 2013 to Carbon Fund Participants and to over 100 experts who participated in REDD+ Design Forums which channeled input into the Methodological Framework. For each topic, the corresponding Issue Paper first presents background research and major approaches, and then suggests initial thinking on how to translate that topic into the context of the Methodological Framework of the Carbon Fund.

Because each paper presents a wide range of options, developed at the very beginning of the MF development process, the original drafts do not capture fully the discussions during Summer 2013 or the September 5, 2013 draft of the MF. For this reason, FMT has added an introductory chapter to each issue paper during August 2013 entitled "FMT Update." This aims to identify further approaches and considerations that emerged since the original paper, though it is not a summary of formal deliberations. Section II of each paper denotes the original Issue Paper. These Issue Papers reflect important context and options for the Carbon Fund of the FCPF and also contain useful information and considerations for policymakers and others designing REDD+ frameworks.

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I. FMT Update (September 2013)

1. Other topics considered in discussions on the Methodological Framework

Many suggestions, issues, and considerations have been raised throughout 2013 on risk of reversal (or permanence). Some of the most salient include:

Considering reversals at a portfolio level or ~~per~~ ER Program level through buffers

Discussion of reversals during Design Forum 1 and subsequent meetings yielded the concept of exploring the feasibility of a buffer to address reversals at the scale of each individual ER Program; or at a Carbon Fund overall portfolio level buffer for the entire Carbon Fund. The FMT has commissioned an issue paper (not yet available) on approaches to buffers to address this topic, including the size of the buffer, how a portfolio buffer would work, how this compares to country-level or program-level buffers, etc.

After the end of the ERPA period, potential ways to address the issue of what happens after 2020 i.e., the permanence requirements of a ER Program beyond the ERPA contract

Ideas to address potential reversals post-2020 that have been discussed include: 1) finding a way to fund the continuation of the reversals mechanism used during the time of the ERPA; 2) host countries and/or ER buyers could transfer to another climate policy regime and adhere to that system's permanence requirements, if such regimes are available and functioning; 3) elaboraingе on the idea of a host country guarantee as discussed in the Issue Paper. Some of these approaches would presume the existence of a post-2020 system for forest credits and/or the continuation of the voluntary REDD+ market 3rd party standards.

As of the posting date, October 11, 2013, addressing risk of reversal remains a particularly challenging MF element.

II. Original Issue Paper (January 25, 2013)

1. Key Questions

Q1. How should CF be designed to minimize reversals, given the piloting nature of all new ER Programs and their inherent risk?

Q2. Permanence Period: Given the Carbon Fund is slated to end in 2020, should ER Programs address risk of reversal until 2020, or longer (e.g., until 2030-2040)? How should CF handle reversals within ERPA period before 2020? How should reversals emission of verified reductions be handled after 2020, and reversals are handled after 2020, who oversees it?

Q3. Who is liable for reversals (seller, buyer or system) A) during lifetime of an ERPA, and B) after the lifetime of an ERPA?

Q4. Should advance screening to calculate potential risk of reversal be required for ER Programs to inform ER Program design or to guide ER Program response to reversals (such as the VCS Risk assessment tool?)?

Q5. How, if at all, should the Carbon Fund differentiate between different causes for a reversal (e.g. natural disturbances vs. intentional reversals)?

Q6: In the Carbon Fund pay-for-performance context, what actions would be acceptable to address reversal? Would addressing a reversal in the Carbon Fund require replacement of tons, repayment of funds, or a combination?

Q7: Should low risk REDD+ activities be exempted from permanence requirements?

2. Introduction

The concept of permanence has typically been considered through the lens of offsets or crediting. In climate and forest policy, it has been mostly tied to project and crediting frameworks under the CDM. Under the CDM, one feature of afforestation and reforestation (A/R) projects is the possibility of *non-permanence*, whereby the stored carbon is subsequently lost though natural disturbances such as fire and wind or anthropogenic disturbances such as harvesting. These disturbances cause the stored carbon to be released back into the atmosphere as CO_2, thus providing only a temporary climate mitigation benefit. This risk in A/R CDM projects is currently handled by issuing temporary credits for carbon storage that expire at some date in the future, requiring replacement at that time.

It is important to distinguish between the concepts of non-permanence, reversal, and non-performance in the context of terrestrial carbon sequestration like REDD+.

- The inherent susceptibility of terrestrial carbon ER Programs to rerelease of stored carbon is described as *non-permanence*. In crediting systems, this can be referred to as *non-permanence* of the credit itself.
- In crediting programs, credits are generated during a time period if there is a net increase (or smaller decrease) in carbon storage relative to the crediting baseline during that period. Should an unanticipated release of carbon subsequently occur, the loss may be termed a *reversal* if it causes the carbon stock to drop relative to the baseline? If the system had already produced a carbon credit, then a reversal that creates a net carbon loss can be viewed as a debit – and some sort of accounting adjustment is necessary to balance the books and restore environmental integrity to the system.
- However, if the disturbance event causes a loss of carbon that is less than the total amount gained elsewhere onsite over the same time period, the end result is not a

debit or reversal *per se* but a diminishment in the number of credits that are generated during that period. The ER Program on balance still gains carbon, but not as much as would have been expected in the absence of the disturbance event, a phenomenon that may be referred to as *non-performance* or under-performance.

- For the purposes of the Carbon Fund and making payments for performance, non-performance will simply affect the amount of payment an ER Program receives whereas a reversal has additional accounting considerations. The remainder of this paper therefore focuses on reversals.

In contrast to a CDM crediting market, where credits enter a compliance market immediately, the Carbon Fund of the Forest Carbon Partnership Facility is a pay-for-performance fund, which will pilot payments for verified emission reductions (ERs) from REDD+ programs. Once an Emissions Reduction Program (ER Program) is approved by the Carbon Fund Participants, the World Bank drafts an Emission Reductions Payment Agreement (ERPA), to be agreed by the REDD+ country and Carbon Fund Participants, and signed by the REDD+ country entity and the World Bank. The ER Program is then implemented, results are reported, and when verifiable emission reductions are generated and independently verified, payments are made to the REDD+ country, and ERs are transferred to the Carbon Fund Participants. It is important to note that ERs that are transferred within the Carbon Fund may not necessarily enter a market. (Tranche A of the CF is unrestricted use, and Tranche B relies on public funds and will retire its ERs)

In the context of the CF, reversals would mean that the CF pay-for-performance mechanism had paid for verified reductions that were later reversed. This outcome would undermine the environmental integrity of the CF and the underlying seller/buyer trust between countries by providing a perverse incentive to host countries. It is therefore advisable to design a method of tracking and financially or atmospherically compensating for reversals.

However, the design and intention of the Carbon Fund, and the challenging and innovative nature of the ER Programs, make addressing reversals complex:

- The Carbon Fund is currently slated to run through only through 2020, a very short timeframe for addressing reversals. This has implications for determining how to handle risk of reversal in the design of Fund's Methodological Framework (MF). Options related to A/R under the CDM, such as temporary crediting (tCER) and generating more credits over time (tonne-year approach), do not apply. Further, if Carbon Fund would propose actions to address reversals after end of ERPA in 2020, who is responsible for implementing it?
- It is assumed that, for any ERs transferred into other climate initiatives as offsets, the buyer would assume responsibility for ensuring that the ER meets the permanence/reversal requirements of that other system. Carbon Fund Tranche A is unrestricted and could fall into this category, whereas Tranche B is publically funded and would be retired.

- Similarly, the issue of different uses for ERs—specifically whether an ER from Tranche A is eventually used as a carbon credit—further complicates the design options to deal with reversals in the CF overall.
- Within an ERPA time period, there could also conceivably be staggered payments after subsequent verification processes. This would likely require an accounting structure to credit and debit ERs within the ERPA period.
- ER Programs proposed to the CF are likely to have significant risk due to the innovative and piloting nature of the Fund. The diversity of new and untested approaches applied in ER Program design, implementation, financing, MRV and reference level setting add to this risk.
- An ER Program's ability to address reversals becomes especially viable when stakeholders and CF participants become confident about the long-term sustainability of a program (based on investments, the economic opportunities that are being promoted, political/private sector support etc.). This may take several years after the design of the program, possibly until 2020 when the CF closes. There are likely to be methods to address reversals in the interim, which need to be decided.

Resolving reversals in the Carbon fund offers both a new opportunity to devise solutions based on full-payment arrangement that differs from forestry within the CDM, but also to discuss the reasonable application of permanence in high-risk undertakings. Sound program design may be the most important instrument to reduce the risk of reversal.

3. Background Helpful to Set the Stage for this Discussion

A. Types of Reversals

Risk of reversal from forest carbon activity are conventionally classified into two types: (1) unintentional reversals due to natural disturbances outside of the project holder's control (such as wildfires, wind, and flooding) and (2) intentional risks caused by purposeful actions of the project holder (such as harvesting, land clearing, and intentionally set fires).

Forests are inherently vulnerable to natural disturbances. Wildfire and wind are common causes of loss, but a great deal of variation exists both within and between each with regard to disturbance frequency, intensity, and area affected. Low-intensity fires may affect large areas but consume only litter and ground vegetation, resulting in negligible carbon losses for an A/R project. Conversely, high-intensity fires can reach into the forest crown and be utterly destructive, with catastrophic results for both previously stored carbon and future sequestration potential. Wind, meanwhile, tends to affect small areas but with great intensity. While the blow-down that results from severe wind events may kill or damage individual trees, stored carbon may not be lost immediately but rather transferred from live tree to dead tree pools where it may be lost slowly over time.

In intentional reversals, a landholder may opt to purposely deplete stored carbon. In some cases, for instance from a planned harvest or a prescribed management fire or thinning, this may be part of the approved ER Program plan and crediting is handled accordingly. For example, the landholder could divest a project or ER Program upon determining that it is no longer economically viable. If this occurs, the carbon accumulated to date would now be subject to reversal that must be accounted for. This could occur if the effort is abandoned or deviates from the plan to seek other objectives (e.g., increased timber revenue). In other cases, the intentional reversal may not be part of the approved plan (e.g. if no longer deemed economically viable) or the project proponent deviates from the plan to seek other objectives (e.g., increased timber revenue). If this occurs, the carbon that the project had accumulated and been credited for to date would now be subject to reversal that must be accounted for.

While it is possible to define broad categories of what is an anthropogenic (or human caused) reversal vs. a natural disturbance, in practice it may be difficult to make a determination if a specific event – such as a fire - was unintentional or intentional.

Table 1. Overview of Reversal Risks (sources and losses adapted from VCS, 2012). The general sources of threats are indicated, as are the mechanisms or vectors of potential loss and the location along a spectrum of risk category as used in this analysis. Some losses may be seen as purely intentional, others unintentional, and still others a combination of both.

Source of Threat	Risk of Loss Due To	Risk Category
		Intentional
Internal to the ER Program	High Opportunity Cost	
	Change in Financial Viability	
	Inadequate ER Program Management	
Institutional	Inadequate Community Engagement	
	Inadequate Land and Resource Tenure	
	Political Uncertainty and Conflict	
Natural Disturbances	Wildfire	
	Pest and Disease	
	Extreme Weather	
	Geological Risk	
		Unintentional

Risk of these reversals can be evaluated in a *screening process*, described below.

B. *Reversal risk management through screening and accounting*

Managing reversal risk management occurs in two stages – screening and accounting. These stages would occur regardless of the policy solution (discussed in Options Section)

Screening: A number of factors – natural, institutional, and internal –can contribute to the threat of reversals. The screening stage assesses these risks to guide decisions about categorical exceptions or risk management requirements. It is possible to conduct preliminary risk analyses using historical data. Any screen (or exception to reversal risk management) must be site- and ER Program-specific and facilitated through a screening

tool or other formally established process or instrument. Screening should take note of the following:

- Location matters. Ground data can reveal where jurisdictions are more (or less) likely to confront reversals.
- Scale matters. Over time, large projects have less relative risk of catastrophic loss from reversal than do small projects. More area in a project means that some part of the project may experience reversal carbon loss, but it is less likely that this would result in an overall (net) reversal in emission reductions credited.
- System dynamics matter. Different species or types of operation in a different disturbance regime may yield different risks.

Risk screening (by ER Programs or, perhaps buyers if they are liable for replacement) has the advantage of providing a systematic view of both natural and anthropogenic risks and allows for separation into categories that can handle risks differently. Furthermore, one must determine the appropriate scale of risk assessment (e.g., national, regional, ER Program, project-level) to guide decisions. The outcomes of risk screening if adopted could include:

- Whether to allow certain ER Programs (and potentially nested projects) to proceed without further permanence considerations (crediting, buffers, insurance, etc.);
- Whether to disallow certain ER Programs (and potentially nested projects) whose risks are deemed extreme;
- Whether to establish terms for risk management (liability, length of obligation, parameter thresholds of various approaches, i.e., buffers, insurance, or country guarantees).

C. *Accounting:*

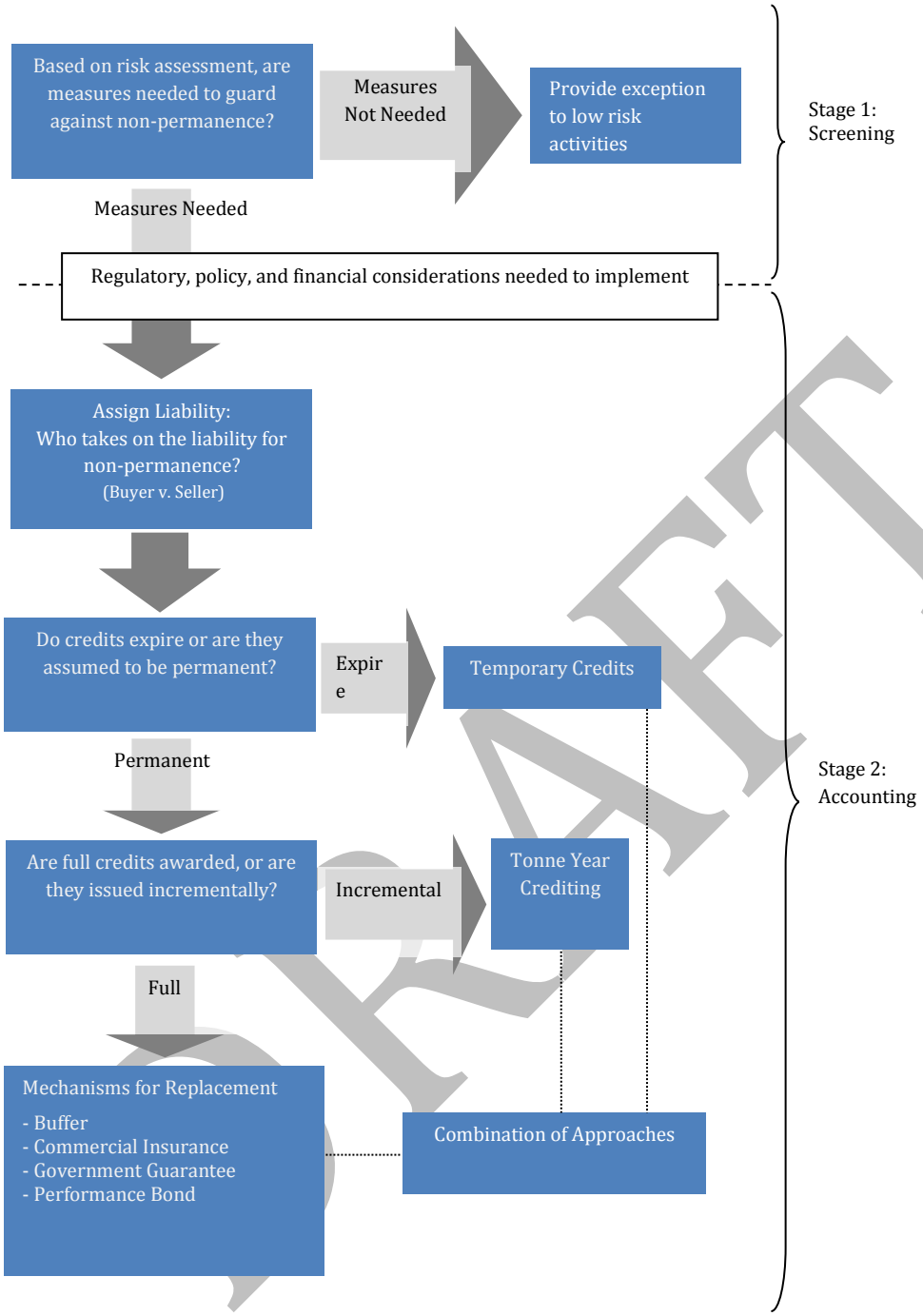
The accounting stage for crediting systems includes the initial crediting that occurs when carbon is stored and adjustments to that accounting (including credit replacement from a buffer if necessary) to ensure system integrity. For the Carbon Fund, accounting for reversal would be mostly likely linked to the repayment or replacement of terrestrial carbon on the host country side. Accounting systems include the policy and structural tools listed in the "Options" section below.

Diversification. Building on scale effects, pooling together risks from a diversity of emission reduction activities can reduce the relative risk of reversal overall. For REDD+ strategies, different types of activities or sub-projects within an area may be considered one type of diversification.

Exceptions to permanence requirements. It may be possible to incorporate an *exception* principle for certain low risk activities within ER programs as permanent (e.g., A/R activities in adequately enforced protected areas).[1] This is a potential way to limit the replacement or monitoring obligations.

Table 2. Example for Discussion: Decision Tree of Project Crediting Scheme

[1] See, for example, Addressing Non-permanence and Reversal Risks of Afforestation and Reforestation (A/R) Activities under the Clean Development Mechanism (CDM). Prepared on behalf of the World Bank Carbon Finance Unit (BioCarbon Fund) by the Nicholas Institute for Environmental Policy Solutions, Duke University. http://siteresources.worldbank.org/INTCARBONFINANCE/Resources/WEB_Addressing_Non-permanence_in_CDM_AR_Activities_Information_Note.pdf (last accessed August 31, 2012).



(Note: Temporary credits and tonne-years do not apply when full ERs are awarded and paid for at once, as in the Carbon Fund. "Projects" referred to in the diagram would be termed "ER Programs" in the Carbon Fund, at generally a larger scale than typical forest offset projects. Liability can be assigned at other points in the process.)

4. UNFCCC and Carbon Fund Guidance Available To Date

A. UNFCCC

Currently, CDM sinks projects address reversals by issuing expiring (temporary) credits. Upon expiration, these credits must be replaced. This replacement requirement raises the cost to the buyer of using them (relative to a full-price permanent credit), thereby reducing the monetary value of the credit and the net revenue flow to the project. As A/R projects have not been widely adopted thus far – they account for less than one percent of all CDM projects to date (UNEP, 2012) – indicating that other approaches for dealing with reversals are needed, as current rules provide a disincentive.

The UNFCCC appear to be open to new approaches. The 17th Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP) in Durban, South Africa, requested the UNFCCC's Subsidiary Body on Scientific and Technological Advice (SBSTA) to initiate a work program to consider modalities and procedures to address "the risk of non-permanence" in A/R activities, starting with activities covered under the Clean Development Mechanism (CDM).

New CDM approaches may also apply to REDD+. CCS in the CDM projects also run the risk of non-permanence, through seepage or pulse release of CO_2 stored in geological formations by the project. The modalities and procedures for geological CCS projects under the CDM addresses this reversal risk through a monitoring period, buffer mechanism, supplanted by provisions for a government guarantee either by the host country or, in lieu of a host country guarantee, buyer (Annex I) country replacement liability. This might be a model, but with analysis for applicability to REDD+ to determine buffer withholding rates customized to the risk profile of the projects. For example, the CCS modalities propose a universal buffer withholding rate of 5%. The empirical analysis suggests that the appropriate buffer size necessary to handle reversals likely depends on the local risk factors, rather than a single universal size proposed for CCS.

Table 3. CCS Reversal Management Modalities Under CDM and Potential Applicability to REDD+

CCS Reversal Management Modalities Under CDM	Potential Applicability to ER Program under Carbon Fund
Place 5% of credits in a reserve account (buffer)	Risks may require buffer withholding rates, customized to the risk profile of the ER Program.
Permanence attained after 20-year monitoring period	Terrestrial reversal risks may increase as the biomass of aboveground pool increases. Monitoring periods for forests are typically longer than 20 years.

Host country guarantee of reversals in excess of the reserve (optional) or Annex I country responsibility for reversals if host country does not guarantee	Host or Annex I country guarantee may be feasible if countries assess risks, their capacity for backing risks, and determine type of guarantee to back the project. Credits sold from non-guaranteed countries may trade at a risk-adjusted discount.
Pool reserve across multiple projects within the umbrella of an ER program	Risk analysis above suggests that the risk diversification by pooling credit reserves of projects may make them collectively more resilient than managing them separately.

B. Carbon Fund

The CF Participants Committee underscored the importance of reversals in its "Recommendations of the Working Group on the Methodological and Pricing Approach for the Carbon Fund of the FCPF" in Accounting Element 4: Address reversals[2]. Innovative instruments for addressing reversals are already a key design element for the Carbon Fund.

It maintains that:

- **"ER Programs should identify potential sources of reversal of ERs (non-permanence); have the capacity to monitor and report any reversal of previously monitored and reported ERs; have measures in place to address major risks of anthropogenic reversals for the ER Program area**

- **"Potential reversals need to be avoided via the design of the ER Program… such as through buffer reserves, use of insurance, effective forest management practices, or other approaches. Such reversals that do occur need to be accounted for to provide environmental integrity…"**

[2] FMT Note 2012-8 June 11, 2012 REVISED FINAL DRAFT

5. Options for the Carbon Fund Guidance to Address This Topic, including Advantages and Disadvantages[3]

A. Liability for Reversals

From an accounting perspective, a reversal occurs once it is detected, quantified, and reported. In a crediting system, standard practice would cancel credits equivalent to the size of the reversal. Since canceled credits mean that the use of the credits for offsetting emissions has been compromised, some replacement of the canceled credits with valid credits would be necessary to restore balance to the system. The issue comes down to who is liable for replacing the credits (or in this case, ERs). We consider four options for the party assigned the liability: (1) the producer; (2) the buyer; (3) negotiated liability; or (4) the "system."

Seller Liability

If the producer of ER assumes liability, they are responsible for any credit loss and repayment terms imposed. A common way to resolve this liability would be to replace the reversed credits (or ERs) with others. The advantage of the producer liability approach is that it provides strong incentive for the project party, who is in the best position to manage risk, to take preemptive action and reduce the risk.

Buyer Liability

An alternative to producer liability is to have the liability transfer with the ownership of the ERs. If a reversal were to occur, any ERs being banked for future use would not be useable for future compliance and would thus be retired. ERs already used to meet regulatory obligations must be replaced by the user. Risk could be potentially handled through a volume adjustment of the number ERs contracted rather than through discounting the ER price paid, as reflected in CF discussions to date.

Customized Contracts Between Buyers and Sellers

[3] These options **exclude the following**, which are not applicable in a full-payment context, but do apply to CDM.

Temporary crediting in the form of tCERs, such as those used in the CDM to date, may provide both intentional and unintentional reversal risk protection to the atmosphere by requiring credits to expire and be replaced periodically; this conservatism comes at a cost, however, and may not be able to adequately incentivize A/R projects.

A tonne year approach to carbon crediting, which issues credits incrementally over time as carbon storage is retained, avoids the need to reclaim credits after they are issued and reversed (either intentionally or unintentionally) to protect system integrity. Our analysis suggests that this approach can be more attractive financially than the temporary crediting approach (since the credits issued are deemed permanent, for which the market will pay more), but this depends on the specific parameters (e.g., the length of the assumed permanence period and the corresponding rate at which permanent credits are incrementally issued for carbon storage).

Long-term contracts between buyers and sellers or direct investment by buyers into an ER Program could involve negotiated agreements between buyers and producers about reversal liability. The contract between the two parties could thus address what happens in the case of reversal. The standardized contract could be set up with default specification of liability for one party or the other, but liability assignment could be modified in the contract if the parties agree to do so. For example, the buyer/investor might bear the risk of unintentional reversals faced by the ER Program (e.g., wildfire), while the seller might bear responsibility for intentional or neglectful actions.

System Liability

System liability (e.g., the CDM or VCS) assumes the liability on behalf of buyers and producers by putting a mechanism in place that pools the risk across the participants. This could occur at the local, national, or international level. Sometimes the risk is shared; for instance, where the producer is liable up to a point and the system is liable beyond that. The underlying premise is that risks are more manageable when diversified across a portfolio. Typical approaches for dealing with system liability include imposing holding requirements on individual projects, establishing a system-wide buffer to pool risks across the entire ER Program, and combinations thereof.

With limited number of programs, system liability could be difficult in early years -- and also given short timeframe of CF. If only 5 programs participate in the CF, for example, the set aside of each ER Program in a buffer becomes large.

Table 4. Liability Options Summary

Liable Party	Description	Advantages	Disadvantages	Examples
Producer	Originator or forest landowner responsible for replacing reversed ERs.	Tied directly to location. Avoids chain of custody complications from producer to buyer. Strongest reversal prevention incentive.	Small producers may not be able to bear risk or may be required to have a large risk premium to do so.	New Zealand ETS.
Buyer	Liability travels with the ER holder – like default risk for bondholder.	Natural extension of compliance performance	Difficult for buyer to properly assess and manage risk. Complicates transaction by keeping unresolved liability on the books for buyers. Monitoring and chain of custody requirements.	CDM through expired temporary crediting (see below). California AB32 in some offset categories.
Customized Contracts	Liability can be negotiated between buyers and producers on a case-by-case basis, using standardized contracts and modifications thereof.	Flexibility to specific circumstances of the project.	Transaction costs of negotiating explicit contract terms. Lack of consistency and fungibility across system can create problems.	Common practice in over the counter transactions.

System	The program manages liability on behalf of the buyers and producers by setting up mechanisms to pool risks and replace ERS as needed after reversals occur.	Pooling risk reduces exposure for individual market participants. Potential for 3rd party program to manage risks through pooling diversity of ERPs (and projects) beyond those supported by the CF.	Risk of underestimating risk leading to system failure.	Voluntary markets. California AB32 for forest carbon credits.

B. Mechanisms to ensure replacement of ERs lost to reversal

When credits or payments are fully awarded upon verification, mechanisms must be in place to ensure that any carbon that is subsequently lost to reversal is somehow accounted for or replaced. These mechanisms can take many forms, and could differ t during lifetime of ERPA and after.

Buffer

A buffer approach requires that some portion of earned ERs be set aside or held in escrow to address non-permanence.[4] If a reversal occurs in the context of a buffer approach, credits from the buffer are used to compensate for the credibility of carbon storage relative to the losses. The size of the set aside within the buffer may vary depending on the inherent riskiness of the activity and the length of time over which the risk is evaluated. For example, an ER Program generating 100 tCO_2e of carbon storage and operating under a 20-percent buffer requirement would receive 80 tCO_2e in credits and place 20 tCO_2e into reserve. The risk assessment stage described above can be an important step in establishing the proper buffer size. Yet, simply setting a high set-aside rate is likely to be counterproductive, however, as it raises the effective cost and could discourage program participation. Buffers should be continually replenished or they run the risk of being overdrawn.

A buffer could be system-wide, but can also be a solution within a host country at a national, jurisdiction or ER Program level. It is also possible to establish project-specific buffers, in which individual project activities contribute to their own reserve pool. (In this way a buffer

[4] Conceptually similar to the buffer is discounting; we do not separately assess its performance here. As opposed to a buffer, discount factors permanently eliminate credits from sale. But similar to buffers, discounts do not necessarily guarantee that resolution of the reversals will occur at the system level (for example, if the actual reversals were higher in percentage terms than the discount). This would cast doubt on the integrity of the program if it were allowed to persist. To address this concern, programmatic discounts could change over time as greater certainty enters the market (Schwarze et al., 2002). Buffer withholding rates could likewise change, though decisions would be necessary on the fate of already reserved credits (e.g., are they to be refunded or do reduced rates apply only to new contributions).

can also link with benefit sharing, where a country could pay well performing entities from buffer.)

- Alternatively, program- or system-wide buffers may be established, with all ER Program activities contributing to a common pool. Buffers should be periodically assessed and "trued up" as needed based on actual performance.

System-wide rules or guidelines will likely be required to ensure that withholding rates are set at an appropriate level and the resulting buffers are sufficiently capitalized on a consistent basis.

ER backing by commercial insurance

This is a promising mechanism that would benefit from further exploration on its applicability to the CF. Insurance has been proposed as an innovative solution to reversals in voluntary market projects. This option is presented below. For the Carbon Fund, Insurance may not a viable option because of the CF's short time horizon (through 2020) and because of few existing carbon insurance products exist to date. Additional demand for insurance, however, may spark companies to develop new insurance products for larger ER Programs in the coming years. Similarly, ER Program host countries could think about country-specific insurance schemes to insure projects or actors within their ER Program.

Regular payments, or premiums, are paid to some insuring entity, which in turn guarantees the permanence of credits generated by the covered activity (e.g., by replacing reversed credits). In the event of loss, the ER Program will likely be required to first pay a deductible. So long as the insured pays its premiums and complies with the terms of its policy, the value of any credits lost to reversals should be covered. In order for the insurance to be effective, the insuring entity must be appropriately capitalized to withstand catastrophic loss. While such commercial products are still rare, insurance may conceivably be used as a supplemental approach to address reversals.[5] See Murray et al (2012) for further discussion.

Host country guarantees

This is a promising mechanism that would benefit from further exploration on its applicability to the CF. An alternative strategy for addressing reversals is to enlist the assistance of a host country entity or other third party to guarantee or otherwise backstop ER Program performance. The host country guarantee approach builds off recent proposals to address residual liability for CCS activities under the CDM, in which the host country acts

[5] Although functionally different than traditional insurance products, ACR presently offers a risk mitigation tool that attempts to fill a similar role (http://www.carbonreductioncorporation.com/; last accessed October 31, 2012).

as a fiduciary backstop to address reversals unresolved at the ER Program or sub-national level.[6] Under this model, a given country (or their designated third party) can choose to assume liability for any losses over and above the provisions made for covering losses (such as a buffer) at the ER Program or sub-national program levels.

The economic viability of such an approach depends on the relationship between the monetary value of expected losses and host country or third-party willingness and ability to devote the necessary resources to cover them. Abuse of the guarantee system, however, could lead to unrealized carbon benefits or a failed REDD+ ER Program. To prevent such abuse, terms and conditions could be developed and incorporated into guidance or regulation that clearly defines the structure of permissible guarantees.

Menu of options (Flexible approach)

ER Program participants could be required to choose among approved options based on their circumstances. A mix of a buffer, minimum permanence period, and host country guarantees could create a workable framework, which could then be tailored to the risk profile of the program and the biophysical characteristics. Special care should be taken to avoid adverse selection (e.g., only the high risk ER Programs, unable to get private insurance, opt into managed buffer systems).

C. Comparing Approaches

This section briefly compares the accounting approaches in terms of their ability to deal with unintentional and intentional reversals.

Intentional Reversals[7]

The table below compares various approaches and how they address intentional reversals. Higher returns are possible (though not guaranteed) when permanent credits or ERs are issued upon verification and set aside provisionally in a buffer. The buffer could, in principle, cover intentional reversals and thereby maintain offset integrity, but this creates incentive problems that could undermine the buffer's ability to cover losses, such as:

- *Moral hazard*, wherein ER Program parties are not sufficiently dissuaded from creating intentional reversals due to lack of financial penalty
- *Adverse selection*, wherein parties who are more inclined to engage in intentional reversals are the parties more drawn to a buffer approach (if many options are available, as discussed elsewhere), thereby imposing risk costs on others less inclined to creating the risk and undermining the stability of the buffer.

[6] Precedent also exists under the Joint Implementation (JI) mechanism, in which project losses must be balanced against a given country's national account.

[7] Or "anthropogenic emissions" as described in CF design elements

These two incentive problems are the main reason why commercial insurance parties will not cover intentional reversals in products they offer. This risk may be heighted in ER Programs because they represent a new and massive government and stakeholder effort that may present unintended adverse consequences to citizens. Governments may later decide that the new REDD+ ER Program simply does not provide enough benefit to warrant the effort.

A similar argument could be made persuasively in the case of buffers, which would suggest disallowing any truly intentional reversal from systematic coverage in a buffer – with the possible exception of cases of ER Program default, where projects operating in good faith nonetheless become insolvent or otherwise financially unable to continue. An adequately capitalized buffer and some further back-up of the buffer (e.g., through host country guarantees) could be considered in these cases, with some precedent to draw upon. Thus, deciding whether and how to include intentional reversals is a key element of REDD+ reversals method design.

Unintentional Reversals

It is difficult to directly compare the ability of the various approaches to guard against unintentional reversals because each approach has a similar goal—environmental and system integrity. It is somewhat easier to compare approaches from a financial perspective, which require price assumptions and conversion to Net Present Value in order to compare.

Table 5. Comparing Approaches on Addressing Intentional Reversals.

	Effectiveness in Addressing Intentional Reversals	Relative Effect on ER Program Financial Returns
Host Country Guarantee	Potentially effective, depending on type of guarantee	
Buffer		
• **Covers intentional reversals**	Variable depends on degree of abandonment and ER Program default risk and extent of coverage.	High/Variable, depends on size of buffer
• **Does not cover intentional reversals (ER Programs pay)**	High, unless abandoned ER Programs cannot pay to replace (default) and no back-up replacement plan exists	Variable, depends on size of reversal that must be paid by ER Program party and whether there is further backing in case party cannot pay replacement tons
Commercial Insurance	Will generally not cover intentional risks (see row above)	Will generally not cover intentional risks (see row above)

6. Potential Candidate Approaches for the Carbon Fund Guidance, and Rationale

The CF should consider a flexible system where ER Program sellers and buyers have a menu of approaches for dealing with reversals, as long as safeguards are put in place to ensure environmental integrity in the most cost-efficient way.

- One of the advantages of a flexible menu-driven system is that it can provide incentives for the establishment of buffer mechanisms and evolution of innovative insurance and financing mechanisms, while providing workable options for ERPs and project developers/investors.
- From the perspective of ERP participants, being able to choose the most suitable approach for dealing with reversals may also be preferred.
- From the perspective of the CF, clear guidelines need to be put in place to support the implementation of different approaches (and combinations of approaches) to ensure that each is verifiable, ensures the environmental integrity of the ER Program, and is practicable to apply.

To underpin the reversals mechanism, the risk profile of ERPs should be determined and an accounting basis developed, including determining whether to include intentional reversals. To do so, the MF should either require or suggest to seller countries the following actions:

- Sellers can conduct preliminary risk analyses using historical data. Any screen (or exception to reversal risk management) must be site- and ER Program-specific and confirmed by an independent auditor, possibly facilitated through a screening tool or other formally established process or instrument that considers location, ground data, scale, and forest system dynamics.
- ER sellers integrate disturbances into their monitoring and reporting system (see MRV paper), which will facilitate their accounting of emissions reductions and reversals. A country may opt to have reversals monitored for the long term (after 2020) to gauge the ongoing sustainability of their program.
- A physical buffer, such as a set-aside of land with sufficient forest carbon to act as a buffer, could also be considered.

Above all, the screening mechanism should carefully evaluate overall risks to the ER Program, and serve to boost sound program design. In high-risk programs, sound design may be the most important instrument to reduce the risk of reversal.

7. Potential Next Steps: Topics on Which Further Analysis or Discussion is Needed

While reversal risk management mechanisms and screenings are useful and concrete approaches for the CF, the participants of the CF will need to make fundamental decisions about the framework that will surround mechanisms to handle risk of reversal.

1. Determine should CF be designed to appropriately minimize reversals, given the piloting nature of all new ER Programs and their inherent risk.

Many or all of the ER Programs likely to come into the CF are likely to be inherently risky due to the innovative and piloting nature of the fund.

2. Determine the timeline in which permanence matters.

Carbon Fund participants need to decide how far after 2020 is ER Program reductions are expected to last, and thereby determine the timeframe in which the CF permanence structure will continue to operate. The release of stored carbon negates the original benefits of storage from an atmospheric standpoint. But practical realities dictate that policy and contract commitment are typically for finite time periods. Hence, policymakers may opt to make "permanence" achievable over a finite time period. This would mean that at the end of this finite period, storage has reached an acceptable level of permanence and no replacement liability remains. Options could include:

- Countries agree to a permanence period beyond 2020, (say to 2030 or 2040?)
- ERs are retired and seller countries are free to conduct reversals.
- Merge ERs with any new UNFCCC mechanism, with its own new reversals requirements.

3. Determine producer, buyer, or system liability.

- Who is liable for replacing the carbon lost during a reversal?

4. Determine what actions constitute a proper addressing of reversal.

- Would addressing a reversal in the Carbon Fund require replacement of tons, repayment of funds, or a combination?

5. Determine the framework needed to underpin the Menu of Options.

- What guidelines are needed to support the implementation of different approaches?
- What guidelines will ensure each combination ensures the environmental integrity of the ER Program?

6. Determine a reasonable way forward on risk assessment.

- Is risk assessment using modeling, forest dynamics, and historic data too burdensome? Or, could a simple risk assessment tool be developed (as VCS is currently undertaking)?
- Should high incidence of natural disturbance (e.g., fires) be incorporated into other elements of the MF, such as the baseline or the payment structure?

7. Determine how to handle catastrophic natural disturbances without unfairly penalizing countries while maintaining atmospheric integrity, e.g. through:

- Adjusting the reference level to "zero out" the emissions associated with certain natural disturbances (e.g. above the "background level") that would have occurred in the absence of the REDD+ program
- Tapping a buffer pool to compensate for reversals due to such disturbances rather than reducing the number of credits issued to the ERP.
- Determine who is responsible for making these decisions