Chapter 3. Permanence

If land-based credits or offsets are to be fully fungible, certain quality assessments must be undertaken and buyer assurances must be made. Offset project methodology and offset accounting principles must meet tests of additionality and leakage, and the results must be measurable, verifiable, and durable. This question of durability or "permanence" is especially complicated when the offset projects involve complicated biological systems influenced by natural events and managed by a set of diverse and sometimes changing individual actors. It is possible, however, to ensure that the environmental benefits of agricultural offset projects will have a lasting effect. This chapter explores the concept of permanence, identifies risks to durability, and discusses some mechanisms to handle these risks.

Definition of Permanence

For carbon sequestration projects, "permanence" refers to the amount of time that the carbon removed from the atmosphere will remain out of the atmosphere. If an offset is to be recognized for removing carbon from the atmosphere, it should have the same impact on atmospheric concentrations of greenhouse gases as an avoided emission. Critics have expressed concern that carbon sequestered in vegetation or soils can be re-emitted to the atmosphere at any time and therefore should not be recognized as an equivalent offset. However, soils and vegetation have been significant sources of increased concentrations of greenhouse gases in the atmosphere, and providing incentives to avoid further emissions from them and to restore carbon stocks in vegetation and soils can produce real benefits to the atmosphere.

In practice, "permanence" is defined differently under different market mechanisms, and the issue of who is liable for ensuring continued sequestration is not a simple one (see Box 3). The market created under the Clean Development Mechanism (CDM) says that increases in carbon sequestered in trees from afforestation or reforestation can only be considered temporary and are not fungible with avoided emissions. Some voluntary markets seek to define "permanence" as a finite number of years and to require that legally binding contracts ensure that any future owners of land commit to maintaining carbon stocks in vegetation and soils for that defined period. For these markets, the question is, What is an appropriate timescale? Other markets recognize that carbon can remain sequestered in products or dead wood pools even if it is removed from the land. For these markets, the question is, How to track stored carbon as it moves offsite, and for how long? Still other markets define "permanence" of an offset as managing risk to ensure the amount of carbon transacted as an offset remains out of the atmosphere. These markets are most concerned about assessing the risk of loss over a portfolio and about the duration of commitments because that affects the structure of insurance products. Ultimately, the terms under which offset trading will be allowed for carbon sequestered in soils and vegetation will depend on policy decisions.

Box 3. Who's Liable? A Market Perspective, by Ricardo Bayon

Who should be held liable—legally and financially—for ensuring that a ton of carbon sequestered today remains sequestered tomorrow, in 30 years, in 100 years, or in 1,000 years? At the most simplistic level, we can argue that whoever uses a sequestered ton to offset their emissions should, in theory, remain liable for the "permanence" of that ton, but this may not be the best way to achieve our climate change goals. In fact, such a simplistic solution may in some cases work against our long-term goals.

To give but one example: When we create carbon markets (or any other environmental markets for that matter), we have two broad overarching goals in mind. The first, and perhaps most important, is to create a system whereby we begin to put a price on the emission of a ton of carbon. This is the sharp point of the carbon market spear, the main and perhaps most important reason for creating a carbon market, the way we achieve the "polluter pays" principle. Achieving this goal, however, is only marginally influenced by any decisions on the definition of permanence. Sure, greater numbers of cheaper offsets will influence the price that emitters have to pay for each ton of emission, and stricter rules on permanence will lead to higher offset prices, but most carbon markets rely on offsets only for a small portion of the tons that are traded. In other words, the relative impact on the price of carbon of a change in the price of a ton of offsets will depend more on how (and how many) offsets are allowed into the trading regime than on any changes to the definitions of "permanence" or carbon lifespan in the system.

Beyond putting a price on each emission of carbon (punishing the "bad"), the second avowed goal of a carbon trading market is to bring money and investment into things we want to see happen (i.e., rewarding the "good"). A well-designed offset market can play a key role in this case. By encouraging private investment and speculation, the offset system can channel capital toward activities that we believe are important in addressing climate change. This is especially true in a system where not all emitting sectors fall under the cap.

Here, the concept of permanence—how we define the "lifespan" of a ton of carbon and who is deemed financially and legally liable for that ton—can have a relatively big impact. For private investors, whose concept of return on investment is measured in months and years, not decades, entering into a contract with liabilities that are measured in centuries can be a non-starter. Even for farmers and landowners who do measure their returns in decades, the concept of signing agreements that encumber their lands for centuries can often be a deal-breaker. This means that if we define "carbon lifespan" in a way that doesn't make market or financial sense, we may be inadvertently hampering our ability to bring capital into activities that we all agree can help us address the climate change problem. Surely, there is a better way.

One way of addressing this problem may in fact be to separate the concepts of "carbon lifespan" and liability. For instance, we can imagine a system whereby we agree that carbon should remain sequestered for 50 or even 100 years, but we deem that carbon investors (and landowners) are only liable for a portion of that lifespan. We could then rely on government to create a fund that would cover the balance of liability. We can look at it as a system-wide buffer, or a government-backed insurance scheme (tools that, despite recent setbacks and bad press, have been used to great effect in the past—think of how the government encouraged homeownership using FannieMae). And we could even charge a fee on each carbon transaction to fund the system. Another way to bring money into such a fund could be to impose a fee on each offset bought since, after all, it is the really the buyers of the offsets that should ultimately be "liable" for the longevity of this carbon. It is, in effect, their liability that this fund would be covering.

To summarize, the concept of permanence (or carbon lifespan) is indeed central to any discussion of carbon sequestration, regardless of whether this sequestration comes in the form of forestry projects, agricultural projects, or carbon capture and sequestration. But lifespan and liability—though related—do not always have to be the same thing. Indeed, by distinguishing between these two concepts, we may be able to design carbon markets that better meet our needs and address our problems.

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Carbon offset projects that sequester, store, or preserve carbon stocks in trees, other vegetation, and soils face the risk of future events, such as fire, disease, or human intervention, causing a loss of carbon to the atmosphere. Such a loss may alter the average carbon stocks during any particular time period and require changes in carbon credits recognized during this time. Carbon losses due to fire, disease, and other natural events may only produce relatively short-lived reductions in carbon stocks that could be made up in subsequent periods and are not of sufficient size and duration to be labeled a "reversal" in all cases. Average carbon stocks on landscapes can be maintained over long periods of time despite periodic carbon losses. Some events can alter the fundamental characteristics of terrestrial sequestration projects, resulting in a reversal.

The environmental integrity of any carbon regulatory system, standard, or protocol requires mechanisms to address permanence. A number of approaches have been developed in voluntary and regulatory carbon markets to ensure adjustments are made to account for potential loss of carbon from forestry and agriculture projects. The potential for carbon loss or reversals is not a sound reason to exclude potential terrestrial sequestration activities, as there are several ways in which these risks may be addressed. Under the CDM, for example, forestry credits were assigned to a separate category of "temporary" or "term" credits. However, experience under this system has shown that temporary credits are not fungible with other credits and have received little market interest.

Although not widely debated, other forms of GHG emissions reductions can also be subject to future events that require alterations in carbon credits recognized during earlier time periods. Some, such as geologic sequestration, can suffer reversals when GHGs removed from the atmosphere are permanently released back into the atmosphere. Others, such as fuel switching, energy efficiency, or renewable energy projects that suffer equipment failures, can result in greater emissions in a particular year than would have occurred without the project, creating additional emissions that may require adjustments to credits recognized in earlier years.

Average carbon stocks on defined areas have been maintained in vegetation and soils over periods of time much greater than hundreds of years despite periodic carbon loss events.

Risks of Carbon Loss or Reversal

Projects may suffer carbon losses from a variety of causes over which the project owner may or may not have control (Table 2). While some carbon losses may constitute reversals, others may represent relatively minor change in carbon stocks over time. For example, fire can release CO2 into the atmosphere but it can also result in more rapid growth during the recovery period following the fire and delayed biomass degradation from charred dead wood pools. Certain projects have more inherent risk than others.

In addition, there is a difference between intentional and unintentional carbon loss or reversals. Intentional actions within the control of the project owner that result in reversals should be required to follow clearly defined requirements to replace affected credits quickly.

Policy can take into account the nature of reversals in that assessments can be made of the net result of the reversal over a distinct span of time and of the nature of the reversal act, whether intentional or unintentional. Project accounting can be designed with rules on how to account for all changes, regardless of intent of reversals that may be encountered.

Table 2. Risk of Carbon Loss and Owner Control over Risks

Risk of Carbon Loss	Owner Control	Carbon Loss
Natural	None-Low	Unintentional
Sociopolitical	None-Low	Unintentional
Technical	Low-Med	Unintentional
Financial	Low-High	Unintentional
Economic	High	Intentional

NATURAL HAZARD RISKS

While management measures can exacerbate or mitigate risks, natural hazards are largely beyond the control of the project owner. Natural risks of carbon loss include:

- **Wildfire** destruction of carbon stocks;
- **Disease** of crops or trees;
- **Insect** infestation of crops or trees;
- **Drought** leading to crop failure, crop-switching;
- **Wind** events, including hurricanes, tornados, micro-bursts; and
- **Floods and other natural disasters**, including tsunami, earthquake, landslide.

Sociopolitical Risks
Carbon assets can be lost due to changing regulatory policy, political instability, or social unrest, as well as due to leakage. In areas with inconsistent enforcement of property rights, sequestered carbon may be removed by trespass (e.g., illegal logging). In other cases unclear land tenure can lead to dispute and to a change of ownership and associated management practices. While destruction of carbon assets by outside actors may be less likely in some places, volatile farm policy and incentives can drive actions that affect carbon stores.

Technical Risks
In some cases carbon may be lost because the technologies or practices used (e.g., soil management, biochar, fertilizer management, crop rotation) fail to maintain carbon stocks as expected. Although technical losses may result, more likely technical risks would result in failure to achieve projected carbon benefits. Since carbon credits are not recognized until produced, these examples would not require any changes in accounting.

Financial Risks
Financial failure of an organization may lead to dissolution of agreements and change of management activities (e.g., increased harvest or land development).

Socioeconomic Risks
Higher-value alternative land uses and rising opportunity costs can lead to a change of management activity or plans. For example, rising land values can cause owners to convert agricultural land to development, high timber prices can lead to increased harvesting, and shifting crop prices or land rental values can lead to crop-shifting or to changes in tillage or other management practices. Price volatility in the carbon market can also influence management decisions away from the GHG-reducing or carbon-sequestering practices. Agricultural carbon projects are complicated by the fact that the entity managing the land is often not the landowner, and the need to maintain sequestered carbon often can outlive the land management agreement.

However, it is worth noting that related sociocultural issues also tend to reduce rapid or large-scale changes in management practices within the agricultural sector. Agricultural producers who maintain a certain practice from which they derive or observe benefits are largely resistant to changing practices unless they can see or be convinced of a greater benefit from the new practice. For example, most farmers who have converted to reduced tillage management of croplands find that the benefits of this change—which typically include improved soil tilth, fertility, and productivity as well as reduced inputs and erosion—make them resistant to change back from it. In addition, equipment used for no-till is different than that used for intensive tillage, so significant investments in equipment generally accompany such a change.

Tools for Managing Permanence Risk

Forestry and agricultural commodity markets have developed a wide range of tools to manage risk over long periods of time, and many of these tools can be used with future markets for offsets. Voluntary markets operating in the United States have also introduced new tools for risk management. This section briefly discusses some of the relevant tools. In general, markets will reward projects that have been designed or structured to reduce the risk of carbon loss or reversal.

Risks will change over time, and new tools will evolve to address them. For example, landownership in the United States has undergone dramatic shifts over the past few decades. In 2003 USDA stated that only 29% of the 927 million acres on U.S. farms and ranches were fully owned and operated by the landowner. In North Dakota, one of about a dozen states where extensive farm-level data are available, the management of cropland is far more likely to be by a tenant renter than by the actual landowner. According to the 2008 Annual Report of the North Dakota Farm Management Education Association, only 28% of land being farmed in North Dakota involves land owned by the land manager.

While it is common for outsiders to view farmers as landowners who have kept the family farm for generations, the reality of today's agriculture is largely absentee owners completely divorced from day-to-day (or even year-to-year) operations and management decisions. To achieve "permanent" sequestration or emissions reductions from changes in agricultural management, project eligibility rules and accounting procedures need to recognize the distinct roles of farm managers and landowners and to devise adequate risk management strategies for each group.

Standards

The most common risk mitigation strategy in commodity markets is standards. Standards define the things that will be measured to gain market entry and how they will be measured. Products that do not meet standards are not accepted for sale. Different grades are frequently assigned to differentiate product quality. Higher-grade products receive higher prices.

Discount, Implicit Reserve, or Risk Assurance Factor

Discussions for managing the risk of reversal in agricultural and forestry sequestration projects have been dominated by the issue of discounting. Most frequently, a discounted predefined risk coefficient is used to account for the probability of a carbon loss or reversal occurring over a set period of time for a defined region or project type—based on risk assessment. All project-based offset credits created are therefore discounted to account for risk of reversals. The disadvantage to this approach is that certain projects will outperform the assessment but with no additional associated credit, which in essence punishes innovative project managers.

Insurance Mechanisms

With all discount, buffer, or insurance mechanisms, the desire to maximize crediting must be weighed against the costs and accounting burdens of implementation. It is also true that there is no "one size fits all" option for managing permanence risk—any number of tools may be used, so long as the overall environmental outcome is assured. Several of these strategies will include assessing risks into the future, after a crediting period ends, to ensure against future reversals for a specified period of time (sometimes called a permanence or a liability period).

Project Buffer Account

Based on the risks of the specific project, a portion of offsets must be put into a buffer reserve established for that project. Depending on the policy construct, these offsets may be recoverable by the owner if no reversals occur. This option is attractive in that projects may be registered and receive credits on an ongoing basis, with a final accounting at the end of the project crediting period. However, assessing risk and assigning a required buffer value on a project-by-project basis may be time-consuming and burdensome for individual (especially small) project owners and for the system administrators who must decide or approve the associated risk for each project.

Pooled Buffer Account

A program-wide pooled buffer account is maintained at all times by the program administrator. Project proponents will deposit buffer credits into the account. The amount of credits deposited depends on the estimated carbon loss for the projects in the aggregate, as estimated during a risk assessment process. Regular monitoring and recalibration of buffer withholding percentages can be used to adjust the size of the pooled buffer account based on actual loss experience. In other words, buffer withholding percentages can be adjusted across all projects based on actual loss experiences. This option removes the burdensome individual project accounting requirement, and the risk of overcrediting can be mitigated through conservative buffer approaches. This option is not attractive to many project developers who wish to receive the maximum number of offset credits available, as all projects are discounted at the same rate.

Insurance Contracts

Project proponents may purchase private insurance to cover the risk of carbon loss or reversals by a program. When a program has a buffer pool, the amount of the buffer would be adjusted to reflect the risk coverage provided by the insurance. As with project-based buffers, this option is attractive in that projects may be registered and receive credits on an ongoing basis. However, assessing risk and underwriting the insurance mechanisms on a project-by-project basis could be particularly costly and time-consuming for small project owners.

Pooled Vehicles

Project owners who have multiple projects may set aside a percentage of all credits to cover potential losses and create a form of pooled self-insurance. In these cases, programs requiring a buffer would recognize the reduced risk of project owners holding a pool of credits to insure their projects against loss. Appropriate measures (e.g., contracts) must be in place to ensure the availability of credits in the event of a reversal. For project owners with multiple small projects, this may offer an attractive hybrid option of pooled risk buffer and insurance. But once again, it may be overly burdensome for smaller projects.

Temporary Liability Mechanisms

Easements or project implementation agreements may legally require landowners to take actions that maintain carbon stocks or make compensation for some or all reversals over a predefined time period. Temporary liability approaches may be combined with insurance mechanisms to help landowners meet their obligations to compensate for carbon loss or reversals during the fixed time period (e.g., for carbon loss or reversals due to natural disturbances). The attractiveness of this option varies greatly with the length of the obligation and the nature of the project owner/project manager relationship. For landowners managing their own projects, a long-term easement may offer the best chance to maximize project crediting while ensuring that no intentional reversals occur. Unfortunately, this approach may also ensure the lowest level of non-landowner project manager engagement.

Term Offset Credits

A commitment period ("term") is defined for maintaining carbon stocks commensurate with the credits issued to a project. At the end of the term, the project landowner must either renew the commitment to maintain the carbon for another term or the credits issued to the project must be replaced (i.e., through the purchase and retirement of an equivalent number of allowances or other offset credits). Responsibility for replacing the credits is generally assigned to the final buyer of the credits. Liability for any reversals that occur prior to the end of a term is generally assigned to the landowner, who may participate in an insurance pool or buffer reserve to help cover the liability. Under the Kyoto Protocol of the UNFCCC, there has been a demonstrated lack of market demand for these types of credits.

POLICY RECOMMENDATIONS

The environmental integrity of any carbon regulatory system, standard, or protocol requires mechanisms to address permanence and the risk of carbon loss or reversal. A number of approaches have been developed in voluntary and regulatory carbon markets to ensure compensation for carbon loss or reversal, during crediting periods, and for future reversals during a "permanence period." As such, the potential of carbon loss or reversal is not a sound reason to exclude potential carbon-reducing activities, as there are numerous ways in which these risks may be addressed.

The members of the Coalition on Agricultural Greenhouse Gases believe that programs and activities should provide for continued storage of sequestered carbon over timeframes that are meaningful in the context of mitigating climate change. One way to address the issue of permanence is "risk-based" analysis of the likelihood that a reversal of sequestered carbon could occur under the crediting period of the project and in the future for a designated period of time. Different project activities have different factors that increase or decrease the risk of reversals. Policy should also distinguish between intentional and unintentional reversals.

The voluntary carbon market is an important source of innovation and a test market for new or untried GHG offset or sequestration methodologies that could potentially be graduated to mandatory carbon markets as long as they meet the quality criteria standards established by the mandatory offset program.