The Making of the Urban Forest Protocol

Permanence

One of the most critical concerns of the Registry is ensuring that any greenhouse gas (GHG) emissions that are registered as having been reduced, remain so permanently. For some industries, such “permanence” is easy to ensure. In livestock projects, for example, reductions in GHG emissions are achieved by capturing and then destroying methane. Once the methane has been combusted, it is permanently gone. In forestry projects, however, permanence is more difficult to demonstrate as trees only store GHG for their lifetime. Once the trees die, they begin to decompose and return their GHG to the atmosphere.

How, then, can permanence be achieved in projects involving trees? The key to understanding permanence in forestry projects is seeing the forest as a whole rather than considering the fate of individual trees. The goal of any urban forest project must be to increase the carbon stocks of the overall forest in perpetuity by replacing individual trees as they are lost. In this way, a sort of “climax state” will eventually be achieved in which the carbon stocks of the urban forest project are maintained at a fairly steady level. For this reason, we have emphasized throughout the protocols that project planners should be concerned with the number of “tree sites” they will be planting, rather than the number of trees.

This leads to the question of what “in perpetuity” entails. True permanence would require that the urban forest project be managed in its “climax state” forever. For ecological, cultural, and legal reasons, this is obviously an impractical requirement. Instead, in keeping with the Registry’s standards and those laid down by other GHG control mechanisms such as the Kyoto Protocol, we have set a standard for project management and reporting of 100 years. *It is our belief that an urban forest project that provides measurable GHG benefits for 100 years can be considered “permanent” in practical terms.*

Many factors will influence how likely a project is to achieve this level of permanence, including (1) the likelihood of site disturbance due to land use change, human impacts, such as vandalism or neglect, and natural disturbance, such as storms; (2) the level of resources (financial and otherwise) that are available and are likely to be available in the future, and (3) the initial and ongoing care that is provided to the project trees. *To assist reporters in creating a project that will achieve the desired level of permanence and to assist verifiers in estimating the likelihood of success, we have required reporters to describe the measures they have taken to limit the risk in each of these categories.*

We feel that, taken together, the 100-year reporting period and the requirement to demonstrate that project risks have been accounted for provides a satisfactory level of permanence.

During development of the protocol, a number of other methods for achieving permanence were considered and rejected, including buffers, reserves, discounting, XXX.

In a scheme involving **reserves**, projects would be required to set aside some of their GHG credits in a buffer account to address the risk of non-permanence. The credits in this account could not be traded but would act to absorb unforeseen losses in carbon stocks should they occur. In theory, the number of GHG tons deposited in the account would be based on an assessment of the project's potential for future carbon losses. One of the reasons this method of assuring permanence was rejected was because we felt that it was not in keeping with the purpose of the Registry, which is to provide an accurate and complete accounting of GHG emission reductions from projects. The reserve scheme would require additional trees to be planted specifically for a project, but would not account the GHG reductions in that effort. Further, the method implicitly required a trading mechanism. For the time being at least, the function of the Registry is to register GHG emission reductions, not to participate in trading schemes.

Two methods of **discounting** forestry projects relative to other, more clearly permanent projects were also considered. Under the first, projects would not be required to report to the Registry for 100 years, but would be discounted by one percentage point for each year they fell short of 100 years. A 45-year project would receive a straight 55% deduction in its reported GHG tons each year. A second discounting method would also have allowed reporting periods under 100 years, but additionally took the perspective that no forestry project could achieve the permanence of GHG emission reductions in other sectors so all forestry projects should be discounted. In this case, the discount for 100-year projects was nearly 50% and shorter projects received additional discounts at a sharply increasing rate. The discounting methods were rejected for a reason similar to that above: discounting involves an arbitrary accounting that does not accurately reflect the project's GHG benefits. Further, the discount would be so substantial a burden that it would be likely to discourage almost all participants. To alleviate the burden of the discounting and to reward projects that were more likely to be successful, we considered adjusting the discount rate by a factor that reflected the levels of risk. Reporters were asked to assess the likelihood of land use change or human or natural disturbance. In cases where these risks were assessed as low the discount factor would be reduced. In the end, we decided this did not adequately address either of the concerns above, and for these reasons, a risk-adjusted discount method was also rejected.

Leakage

According to the International Panel on Climate Change, leakage is "the unanticipated decrease or increase in greenhouse gas benefits *outside of the project's accounting boundary* as a result of project activities." There are two kinds of leakage: activity-shifting and market. According to the FAO, market leakage involves the modification of the overall market as a result of the implementation of a project. For instance, if a forestry project is initiated to reduce timber harvesting in a certain area, but the market for timber remains the same, the harvesting will simply shift from the project area to another area and overall carbon stocks will remain the same. Because there is little market for urban forest products and because the investment that entities have made in urban trees is generally greater than any market value, this type of leakage is negligible and is not considered in the Protocol.

Activity-shifting leakage is easier to understand in the context of nonurban forest projects. It involves the shifting of timber harvesting (the activity) from the project area to nonproject areas, resulting in no net increase (or less of a net increase than is reported) in GHG benefits overall. This sort of leakage is guarded against by requiring forest entities to report the carbon stocks of their entire forest resource, allowing verifiers to assess unexpected changes in the inventory.

In urban forestry projects, activity-shifting leakage of this sort is unlikely for the reasons mentioned above. The most likely form of leakage is the shifting of funds and maintenance from the nonproject tree resource to project trees. For example, if funding is reduced for pruning existing trees to fund a GHG tree planting project, there may be an overall decline in the health of the urban forest, and long-term increase in mortality, leading to an overall decrease in carbon stocks. Finding a way to guard against this sort of leakage is more difficult than simply requiring an inventory of the entity's carbon stocks. Changes in forest structure due to reduced care may take many years to appear and by the time they are apparent, may be too entrenched to correct.

We determined that requiring entities to document the care and funding they are providing their nonproject trees is the best way to ensure that activity-shifting leakage is not occurring. Entities are required to submit a tree maintenance plan (TMP) that covers five program areas: tree planting, small tree care (< 6" dbh), large tree care (>6 inch dbh), tree removal, and administration/other (e.g., clerical, training, outreach). In each area, the annual expenditures and level of service must be estimated for at least the next 10 years. If these values fall more than 10% below what is expected in a given year without justification, leakage is assumed to have occurred and emission reductions for that year cannot be reported.

During development of the protocol, we also considered the most obvious strategy—to make use of the methodology employed in the forest protocol. This would require entities to forecast the carbon stock of their entire tree resource for the length of the reporting period, measure the actual carbon stock each year and assess any differences between the two. This method had two obvious disadvantages. First, as mentioned above, any changes in carbon stocks due to reduced maintenance would be very subtle from year to year (most likely within the margin of error for measurements or calculations), although their cumulative effect would eventually be devastating. Second, inventorying of urban forests is much more cost-prohibitive than inventorying nonurban forests and no method exists for projecting urban forest growth. An expensive, yet ineffective method was clearly not a good one.

Additionality

A project must demonstrate additionality, that is, it must go beyond what would have occurred in the absence of the project; it must exceed "business as usual." Determining additionality, however, is no small task; generally speaking, two different strategies have been employed to do so. First, additionality can be measured against historic performance on a case-by-case basis. To do this, each entity must be able to document its historic practices and trends and forecast the effects these would have if carried into the future.

Any GHG benefits of a project would be measured against this forecast. This is the method employed by the Kyoto Protocol and other, early GHG reduction schemes. It offers the benefit that additionality is clearly demonstrated for each project. This benefit is offset by the difficulty and resources (time and money) associated with judging projects one at a time and also doesn't allow for participation by entities without historic data. For urban forest projects, assessing additionality based on historic performance was considered especially difficult as many urban forest entities do not have accurate records of tree plantings and removals.

For the most part, the case-by-case basis for assessing additionality has been abandoned in favor of judging projects against a performance standard, which is determined based on best management practices within the sector. The Registry favors this method because it provides a high level of certainty to project developers, investors and regulators and because it is clear, consistent, and facilitates prompt and accurate verification. The main argument against this approach is that at the level of individual projects, true additionality is not always achieved. Consider, for example, an entity that is already performing above the performance standard. It is able to register all emission reductions that occur above the standard even if these do not exceed its actual "business as usual" performance. However, these very high-performing entities will be balanced out by poorer-performing entities who must first meet the performance standard before they can register reductions even if the standard is above their business as usual level. It is assumed that, in the end, an overall balance will be achieved between these two.

In keeping with the Registry's preference, we have decided in favor of the performance-standard approach for assessing additionality. Setting the performance standard, however, was no simple matter. There were two steps involved. First, the general approach had to be determined. Would the performance standard be measured as a certain percentage of canopy cover that had to be achieved; an annual percent increase in canopy cover; maintenance of the status quo in terms of carbon stock or number of trees; a net gain in the number of trees? Second, once the general terms were determined, an actual value had to be set.

To begin with, we considered requiring entities to demonstrate that they had achieved a certain percentage of canopy cover before GHG emission reductions could be reported. This ensured that any entity meeting the standard was certainly practicing at the highest levels and also it was a standard that would only have to be met once, at the beginning of the project. It also appeared at first that measuring compliance with such a standard would be fairly easy with the help of remote-sensing technology. These benefits, however, were outweighed by several significant costs. First and most importantly, achieving a certain canopy cover could be an enormous undertaking, requiring the planting of thousands or even tens of thousands of trees at huge expense. Many years would be needed before the trees reached maturity and the canopy cover requirement was met. Second, there was the practical difficulty posed by the fact that the urban canopy cover is composed of trees belonging to many different entities—the city itself, utility companies, institutions, and private citizens—often all on the same block. Should a municipality wishing to report a project be judged based on how many trees its citizens had planted in their yards? Should they receive credit toward the performance standard for those trees? If not, how will ownership of the trees be determined? Third, one national standard for canopy cover could certainly not be set. Cities in the eastern United States, which were carved out of existing native forests, could not be held to the same standard as cities in the Southwest, where trees are not a natural component of the ecosystem. Similarly, should very dense, urban cities such as New York be required to achieve the same canopy cover as more suburban cities? Finally, there was no direct, proportionate link between achieving a certain canopy cover and demonstrating additionality. The goal of the protocol is to encourage projects that will increase carbon storage above current levels; there is no reason an entity's forest should have be a certain size first.

Instead we considered requiring entities to achieve a certain *annual growth* in their tree resource. This could be measured in several ways: as an increase in carbon stock, a percent increase in canopy cover, or an increase in the number of trees. Using percent increase in canopy cover would involve some of the same difficulties as discussed above, in particular determining which trees belonged to the reporting entity. Also, canopy cover changes in one year would be difficult, if not impossible, to ascertain and would only be visible over many years. Furthermore, measuring them would require annual inventories, which would greatly add to the expense of a project. Setting the performance standard based on an increase in carbon stocks would be the most accurate and relevant method as carbon stocks are the focus of the protocol. This method, however, would also require frequent inventorying of the entire entity resource, at great expense. A performance standard based on an increase in the number of trees, however, would require only that entities maintain records on the number of trees planted and removed each year. This method has the disadvantage of not fully capturing changes in carbon stock; if large trees are removed and replaced with small trees, the overall carbon stock of the urban forest may be decreasing over time. We considered this concern to be negligible because tree-planting entities are motivated by other criteria than meeting the performance standard; trees planted to meet the requirements of the Registry will still need to address the demands of the community as they always have.

Having decided to pursue a performance standard based on a net gain in the number of trees, the proper metric had to be determined. First we considered requiring entities to merely achieve a "no net loss" of trees, i.e., that any tree that was removed had to be replaced, but any additional trees could be considered as project trees. This offered the valuable advantage of great simplicity. It was also a method of judging additionality that reflected, in a way, some of the virtues of the business-as-usual model. The biggest benefit of the business-as-usual standard is that it reflects the fact that the current level of GHGs in the atmosphere is a reflection of all of the different GHG-related activities (coal combustion, fuel use, carbon sequestration by trees, water and soil, etc.) as they are occurring right now. Any projects undertaken to reduce GHG activity will impact the current state of the atmosphere. In this way, it could be argued that the business-as-usual status of an urban forest is its condition at a particular moment in time, and that the impacts of a GHG-reduction project should be measured against that condition. However, the Registry requires that performance standards be set based on best management practices, and the best performing entities are clearly increasing the size of their urban forests.

A performance standard that achieved a positive net gain in the number of trees was therefore necessary. Clearly, a blanket number of trees per year applied to all entities, large and small, didn't make sense. We felt there were two options: a metric based on the number of existing trees or on the human population. A metric based on the existing trees offers the benefit that it indirectly accounts for things like eco-region and social factors. The current tree population is probably, in part, a reflection of entity size and location. However, it seems to some extent intuitively backwards, in that an entity with a large tree population will have to plant more trees each year than a program with a few trees. As well, larger tree populations are likely to have fewer available planting spaces for new trees. This method also had the unfortunate effect of encouraging tree removal prior to the start of a project to reduce the planting burden. Finally, this method was not dynamic, in that it didn't accommodate the potential growth of cities over the 100-year reporting period.

In the end, we decided on a dual-metric approach, one for municipalities and one for campuses. Municipalities would report in terms of a net-tree-gain metric based on human population. Data on human populations are readily available from the US Census Bureau and can't be manipulated to lower a city's performance standard. Growth (or decline) in cities is reflected in changes in human populations over time, which creates a dynamic performance standard that ties changes in city size to changes in tree numbers. Finally, unlike the tree-numbers metric, which assumes that the more trees you have the more you can plant, the human-population metric assumes that the more people a city has, the greater its tax base and therefore, the greater its ability to fund higher levels of planting. For campuses, we felt that trees per acre was better than trees per capita because of the very wide discrepancy in human densities.

Once the metrics had been decided on, values had to be set. The municipal performance standard is based on an analysis of 18 U.S. cities that found on average 1.16 trees were planted for each tree removed. Normalizing the net gain in trees (planted minus removed) on a per capita basis resulted in an average annual of 0.001 net tree gain per capita. The campus performance standard was set based on a survey of 12 California campuses that found, on average, universities are planting 1.33 trees for every tree removed. Normalized on a per-acre basis this equaled 0.03 net gain trees per total maintained campus acre (buildings, streets, recreational areas, and maintained landscapes) per year.

For the final type of entity, utility companies, the performance standard was set at zero. Our national survey estimated that only 15 of 3,170 (0.5%) utilities have tree planting programs beyond replacing trees removed during line clearance operations. Most of the utilities with tree planting programs specifically aimed at storing carbon and conserving energy are planting fewer than 400 trees annually. Further, because the trees are donated to other entities (residents, business owners, municipalities) and not maintained by the utility companies, data on survival are not available and therefore the metric here would be inconsistent as it would represent only planting rates and not true net tree gain.

Deductions: Enforcing the performance standard over the project lifetime

The performance standard represents a baseline for growth into the future above which all GHG benefits can be reported. It is a standard that must be met throughout the project lifetime, otherwise additionality is not being demonstrated. Therefore, an enforcement mechanism must be in place to account for noncompliance.

Consider, for example, an entity whose required net tree gain is 100 trees per year. In year 5 of the project, however, they achieve a net gain of only 80 trees. Although their project trees continue to store carbon and offer GHG benefits, all of the benefits can no longer be considered additional. How can we account for this? We considered several possibilities.

First, and simplest, we considered not allowing any reporting of GHG benefits in years where additionality is not achieved. For practical reasons of arboriculture, however, this was not feasible. In our example above, the entity could have achieved a net tree gain of 110 trees in the summer of that year and then been affected by a winter storm in early December, requiring an additional 30 to be removed in the last month of the year. There would be no way to replace the lost trees outside of the planting season, and it seemed excessively punitive to punish the entity before allowing an opportunity to remedy the situation.

This led us to the second option: calculating the average net tree gain over several past years. This still failed to resolve the problem above. Even if an entity was on track to achieve the performance standard averaged over several years, unforeseen occurrences just before the end of the reporting year could drop the average below the threshold. In the example below, imagine that the entity had met the net tree gain in the summer of year 5 and was in fact, on average, slightly ahead (102). Nevertheless, a bad storm late in year 5 drops them below the threshold again.

Year	Required net tree gain	Achieved net tree gain	Running 3-year average net tree gain
1	100	100	100
2	100	105	105
3	100	100	102
4	100	100	102
5	100	90	97

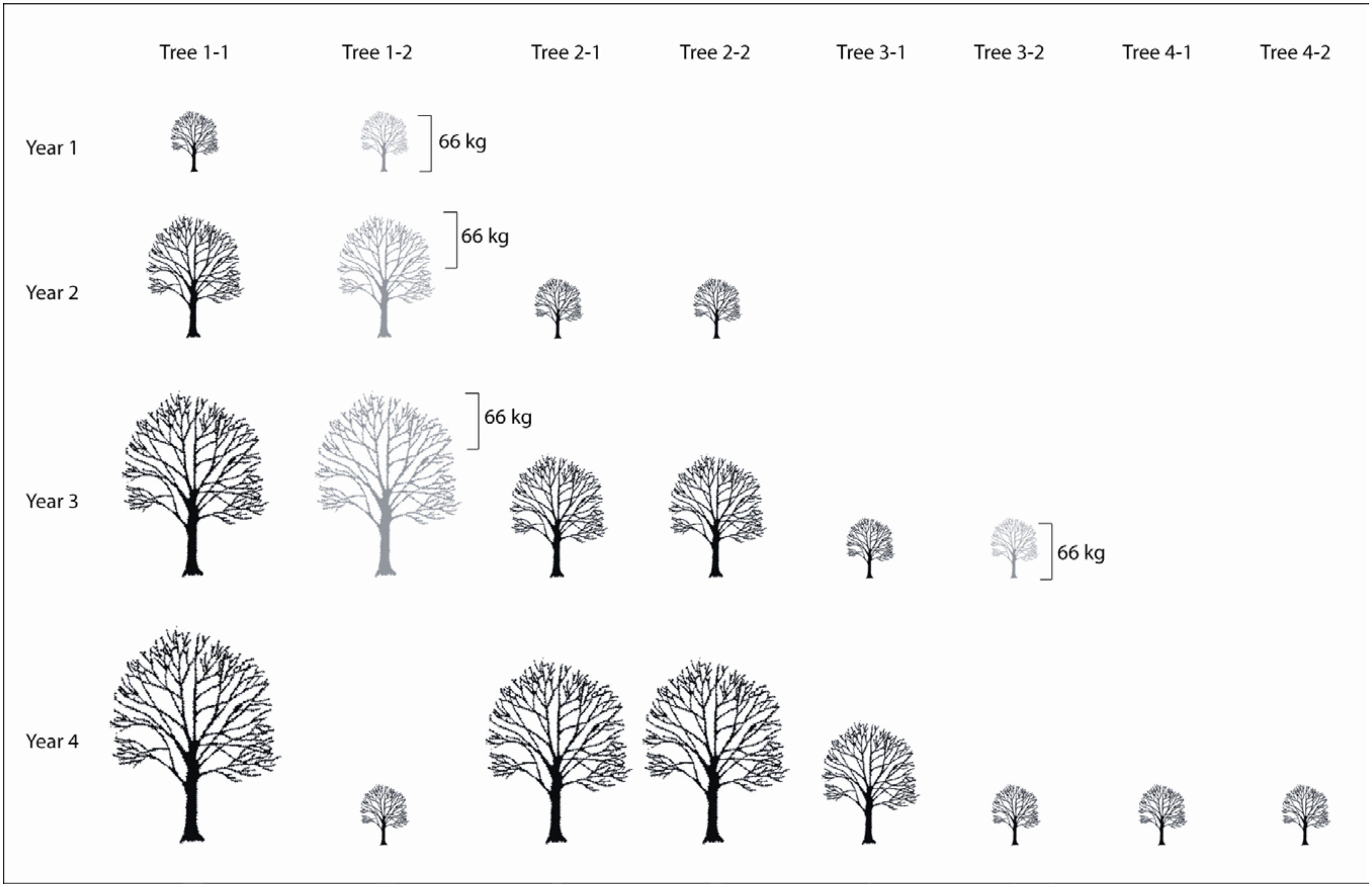
Alternatively, there could be a time lag, with the average calculated using net tree gain from the previous year, the reporting year and the following year. This would allow an entity to “catch up” with tree planting when necessary.

Year	Required net tree gain	Achieved net tree gain	Running 3-year ave. net tree gain
1	100	100	100
2	100	105	105
Reporting year	100	90	98
4	100	104	100

Unfortunately, the Registry's deadlines for reporting are June of the year following the reporting year and could not accommodate this scheme.

Ultimately we decided on a method that would keep a running total of the required net tree gain and apply a deduction to the reported benefits based on the amount of GHG that weren't sequestered in the reporting year. In this scenario, for each tree that an entity was short in its net tree gain, a year's worth of GHG sequestration would be deducted from the reported carbon. For each year that the entity continued to fail to plant that tree, another year's worth of sequestration would be deducted. The annual deduction rate was set at 66 kg/tree/year, the average annual rate of sequestration for a city tree, based on our research in 18 high-performing cities.

This is perhaps best illustrated with an example and a diagram (below). Consider, for the sake of simplicity, an entity with a required net tree gain of 2 trees per year. In year 1, only one tree is planted, leaving a deficit of one. In year 2, two trees are planted, leaving a running deficit of one. In year 3, one tree is planted, leaving a deficit of two (the one from year 1 that still hasn't been planted and the one from this year). In year 4, four trees are planted, which cancels out the running deficit. For each of the deficit trees in each year, a deduction of 66 kg is made from the reported GHG tons, or 66 kg in years 1 and 2 and 132 kg in year 3.


Tree 1-1
Tree 1-2
Tree 2-1
Tree 2-2
Tree 3-1
Tree 3-2
Tree 4-1
Tree 4-2
Year 1
Year 2
Year 3
Year 4
66 kg
66 kg
66 kg
66 kg