Application of the CCQI methodology for assessing the quality of carbon credits

This document presents results from the application of version 3.0 of a methodology, developed by Oeko-Institut, World Wildlife Fund (WWF-US) and Environmental Defense Fund (EDF), for assessing the quality of carbon credits. The methodology is applied by Oeko-Institut with support by Carbon Limits, Greenhouse Gas Management Institute (GHGMI), INFRAS, Stockholm Environment Institute, and individual carbon market experts. This document evaluates one specific criterion or sub-criterion with respect to a specific carbon crediting program, project type, quantification methodology and/or host country, as specified in the below table. Please note that the CCQI website Site terms and Privacy Policy apply with respect to any use of the information provided in this document. Further information on the project and the methodology can be found here: www.carboncreditquality.org

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Sub-criterion:	**1.1.3 Financial attractiveness**
Project Type	**IFM – Extended rotation age**
Date of final assessment:	**21 February 2024**
Score:	**Projects with a conservation easement that requires the project activity (relevant for US): 1** **Projects in the US (without a conservation easement that requires the project activity) / Projects in other countries:** **Rotation age extended by a short time span: 1** **Rotation age extended by a medium time span: 2** **Rotation age extended by a long time span: 3**

Assessment

Relevant scoring methodology provisions

The CCQI methodology assesses the financial attractiveness of an individual project or a project type to estimate the likelihood that economic actors would normally not pursue the respective mitigation activity in a given market and policy environment without carbon market revenues.

The CCQI methodology considers three factors in its assessment: the financial attractiveness without carbon credit revenues, the change in financial attractiveness due to carbon credit revenues, and the financial attractiveness with carbon credit revenues. To implement this approach, the methodology uses three indicators: the internal rate of return (IRR) without carbon credit revenues (indicator 1.1.3.1.), the change in the IRR due to carbon credit revenues (indicator 1.1.3.2.), and the IRR with carbon credit revenues (indicator 1.1.3.3.).

However, this type of analysis is not suitable for the project types 'avoided deforestation' and some subtypes of the project type improved forest management (IFM), as they typically do not involve a major investment at the start of the project. In contrast, they entail that an activity is not pursued (e.g., a forest is not deforested or degraded) or that an ongoing practice is changed (e.g. a change in forest management practice). We therefore deviate from the methodology to reflect the specific circumstances of this project activity.

For extending rotation age activities, the most relevant consideration for financial attractiveness is how the profits in the project scenario compare to the profits in the baseline scenario. In other words, how many revenues are forgone by changing the rotation age. To answer this question, we consider the reasonings behind determining the optimal rotation age according to economic theory. As a purely theoretical approach does not consider all factors that come into play in the decision-making process, we will also consider the limitations to the economic theory in the context of carbon markets. This analysis is substituting for the analysis for indicator 1.1.3.1. of the CCQI methodology.

As a second step, we further discuss the influence of carbon credit revenues on the financial attractiveness of the project (sub-)type. This analysis substitutes the assessment of indicators 1.1.3.2 and 1.1.3.3 in the CCQI methodology. If the proceeds from carbon credits have a strong influence in changing the financial attractiveness of an activity, it is more likely that the carbon market revenues are decisive in making the activity financially viable.

Information sources considered

1 Kaarakka, L., Cornett, M., Domke, G., Ontl, T., & Dee, L. E. (2021). Improved forest management as a natural climate solution: A review. Ecological Solutions and Evidence, 2(3), e12090.

2 Płotkowski, L., Zając, S., Wysocka-Fijorek, E., Gruchała, A., Piekutin, J., & Parzych, S. (2016). Economic optimization of the rotation age of stands.

3 Congressional research service (2022). The Tax Deduction for Conservation Easement Contributions.

4 Brown, S. A., Rotman, R. M., Powell, M. A., & Wilhelm Stanis, S. A. (2023). Conservation easements: a tool for preserving wildlife habitat on private lands. Wildlife Society Bulletin, e1415.

5 American Carbon Registry. The American Carbon Registry Standard, Version 7.0.

6 Climate Action Reserve. Forest Project Protocol, Version 4.0.

7 Ekholm, T. (2020). Optimal forest rotation under carbon pricing and forest damage risk. Forest Policy and Economics, 115, 102131.

8 Ndjondo, M., Gourlet-Fleury, S., Manlay, R. J., Engone Obiang, N. L., Ngomanda, A., Romero, C., ... & Picard, N. (2014). Opportunity costs of carbon sequestration in a forest concession in central Africa. Carbon balance and management, 9(1), 1-13.

9 West, T. A., Wilson, C., Vrachioli, M., & Grogan, K. A. (2019). Carbon payments for extended rotations in forest plantations: Conflicting insights from a theoretical model. Ecological economics, 163, 70-76.

10 van Kooten, G. C., & Johnston, C. M. (2016). The economics of forest carbon offsets. Annual Review of Resource Economics, 8, 227-246.

11 Ecosystem Marketplace (2021). A Green Growth Spurt – State of Forest Carbon Finance 2021.

Assessment outcome

The scoring for the IFM activity 'extended rotation' can be taken from the following table:

Table 1 Scoring for IFM - Extended rotation projects

By how much time is the rotation age extended?	**Projects in the US**		**Projects in other countries**
	With conservation easement that requires the project activity	Without conservation easement that requires the project activity	
A short time span (e.g., less than 7 years or less than 30% of the optimal rotation age for that species)	1	1	1
A medium time span (e.g., between 7 to 25 years or between 30%-100% of the optimal rotation age for that species)	1	2	2
A long time span (e.g., more than 25 years or more than 100% of the optimal rotation age for that species)	1	3	3

Justification of assessment

Project type

Improved forest management

"Changes in forest management that increase forest carbon stocks, and/or avoid the loss of forest carbon stocks."

Project subtype

Extended rotation (ER)

“Extending the rotation (e.g., age or target diameter) at which trees are harvested in a forest or patch of forest.”

Determining rotation age based on economic theory

To understand what economic implications extended rotation activities have, we consider how the time of harvest is normally determined. Generally, the age at which a forest stand is cut depends on the management objectives. Most of the time, those are primarily economic objectives, such as the age at which the trees can be used for specific products or which age provides the maximum profits. According to economic theory, the optimal rotation age is the age that maximizes the profits (i.e. income minus costs).

The economically optimal rotation age is based on the following considerations:

- After planting, initially the forest volume and value increases, since the trees grow in diameter and gain more desirable characteristics, and harvesting costs decrease due to economies of scale. However, as time passes, the forest volume increase, in concert with the value, slows down and halts in the long run (Source 2).
- Moreover, delaying harvest also increases the risk of natural disturbances because older trees are more susceptible to insects and diseases, as well as an increased fire hazard due to a build-up of fuel (Source 1). Therefore, in delaying harvesting, forest owners take on an increased risk that their revenues would decrease, which they have to factor in when determining the costs of delaying harvesting.
- To determine the optimal rotation age, the marginal income is juxtaposed with the marginal costs of delaying harvesting for one more year. The incremental income is the added value of growing the forest one more year; the costs are equal to the interest that would be gained in the same period if the forest was harvested, and the resulting capital was invested (Source 2).
- Harvesting should only be delayed until the point in time when the increase in value no longer exceeds the costs of delaying harvesting for one more year. This point is the economic optimum (Source 2).

This means that, according to economic theory, extending the rotation beyond its economic optimum to further enhance carbon storage would necessarily be additional, since the forest owner is foregoing profits due to not harvesting at the economically optimal time.

Limitations

In principle, carbon credits can compensate for the loss in profit of delaying harvesting and thus lead to an extension of the rotation age. In practice, the influence they have on the decision to postpone harvesting depends on the specific circumstances. This is because determining the optimal rotation age or diameter comes with considerable uncertainty regarding the assumptions made about the costs and benefits of delaying harvesting.

These are, inter alia:

- assumptions about the future price of timber;

- assumptions about the costs of harvesting, which are dependent on labor costs, costs for machinery, etc.;
- assumptions about ecological factors, e.g., how much forest growth is to be expected in that region, or how climatic conditions will change, etc.

The uncertainty regarding these assumptions could decrease the likelihood of additionality in two ways: First, project developers could use information asymmetry in their favor, as only they know the assumptions based on which they calculate the rotation age. For example, if forest owners expect timber prices to increase in the future, they might delay harvesting beyond the current practice, even without carbon revenues.

Second, there is an inherent variability of harvesting schedules. A forest owner might vary the time of harvesting when circumstances change, e.g., in case the forest did not grow the amount of time expected. Thus, independently of the impact of carbon credits, the rotation age or diameter at which harvesting takes place may change over time.

How much these uncertainties influence the additionality risk depends on the amount of time the rotation age is extended beyond the optimal rotation age for a certain species. Thus, we differentiate three cases:

- An extension by a short time span (e.g., less than 7 years or less than 30% of the optimal rotation age): This still falls under the natural variability of harvesting schedules. Therefore, there is a very high likelihood that the rotation age would have been extended in any case.
- An extension by a medium time span (e.g., between 7 and 25 years or between 30 and 100% of the optimal rotation age): An extension by a medium time span would be less dependent on current circumstances. Thus, the likelihood that carbon credits impact the decision to extent the rotation age would be higher than for a short time frame.
- An extension by a long time span (e.g., over 25 or over 100% of the optimal rotation age): This would be, under most circumstances, equal to a cessation of logging. Such an extension could mean that trees might grow so large that harvesting them is likely not financially viable. Furthermore, one cannot consider the implications of extending the rotation age by such a long time span. It is important to note, however, that there might still be legal differences between the extension of the rotation age by a long time span and managing a forest for conservation.

Special circumstances – Conservation easements in the US

'Conservation easements' are incentive mechanisms for ecological objectives in the US, which can increase a project's economic attractiveness substantially. We therefore include them in our analysis of additionality for IFM projects in the US.

A conservation easement is a legal agreement under which private landowners voluntarily transfer certain land use rights to a conservation easement holder, such as a trustee or the government. A conservation easement is concluded with the aim of fulfilling certain conservation objectives, such as protecting trees or geological resources. Each conservation easement has its own specific terms. They can prescribe a variety of activities, from limiting the frequency of harvesting, to requiring certain management practices. In return, private landowners receive a remuneration in the form of substantial income tax reductions of up to 50% (or 100% for ranchers and farmers). These may be spread out over several years and may vary depending on the federal state or jurisdiction (Source 3, Source 4).

Due to the substantial financial benefits of conservation easements, they can make a project financially attractive without carbon credits. They therefore decrease the likelihood that a project activity is additional, if this activity is required by the conservation easement.

It is important to note that the two major carbon crediting programs that offer carbon credits from IFM projects in the United States, American Carbon Registry (ACR) and Climate Action Reserve (CAR), both restrict projects with long-standing conservation easements, as they consider them to be a legal requirement. Projects are not considered additional if the easement was recorded more than one year prior to the project's start date (Source 5, Source 6). However, they still permit newly concluded conservation easements. Thus, conservation easements are still a relevant consideration when assessing the additionality of IFM projects registered under ACR and CAR.

The Verified Carbon Standard (VCS), which also offers carbon credits from production to conservation projects in the US, has no provisions regarding conservation easements.

The impact of carbon price

To assess the impact of carbon credits, we would need to compare the total project cost per ton of CO_2 to the carbon price. However, since there is no dataset containing information on the total cost of extended rotation projects or their corresponding carbon price specifically, we use scientific literature and aggregated price data for IFM projects.

Scientific literature shows that there are a variety of factors that influence how much a certain carbon price can extend the rotation age, such as tree species, geographic location, the discount rate, assumed time horizon, whether it is the rotation age or the diameter that is extended (Source 7, Source 8). For example, West et al. (2019) found that if a species is growing slowly and has a high timber value, the opportunity costs are too high to be compensated by carbon credits. On the contrast, if the species is fast growing, carbon credits are more likely to compensate for an extension of the rotation age (Source 9).

Correspondingly, modelling exercises also largely indicate that while a carbon price can incentivise an extension of rotation, it varies greatly by how many years. For example, van Kooten and Johnston (2016) found that at a carbon price of USD 25, the rotation age of interior/boreal forest can be extended by 2-5 years (at a 2.5% discount rate) or 14 – 63 years (at a 5% discount rate) (Source 10).

According to a report by Ecosystems Marketplace, the price in the voluntary carbon market for carbon credits from IFM projects ranged between USD 6.54 and USD 18.84 in 2019 (Source 11)[1]. This may indicate that the CO_2 price is in the same range to cover the costs for extending the rotation age in some cases. However, the variability of the project circumstances, cost estimates and carbon prices does not allow for a definitive conclusion.

Conclusion

In economic theory, extending the rotation age or diameter beyond the economic optimum is necessarily additional. However, in practice, there is considerable uncertainty in determining the economically optimal rotation age, as it greatly depends on the assumptions regarding costs and benefits of delaying harvesting. Moreover, the optimal rotation age for a specific forest stand can

[1] These are the most recent estimates; there is no time series data available.

change over time, depending on the circumstances. Therefore, there is the possibility that even without carbon credits the rotation is extended beyond current practice.

An analysis of the potential impact of carbon credit was inconclusive, due to the substantial variance in total cost estimates.

We therefore apply an expert judgement, and differentiate the scoring depending on how much the rotation age is extended (see Table 1)

Furthermore, we lower the scoring by two points if there is a conservation easement in place. A conservation easement constitutes a *de facto* subsidy for landowners and is therefore a substantial income in the project scenario, which reduces the likelihood of additionality.

The scoring for the IFM activity ‘extended rotation’ can be taken from the following table:

Table 2 Scoring for IFM - Extended rotation projects

By how much time is the rotation age extended?	**Projects in the US**		**Projects in other countries**
	With conservation easement that requires the project activity	Without conservation easement that requires the project activity	
A short time span (e.g., less than 7 years or less than 30% of the optimal rotation age for that species)	1	1	1
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A long time span (e.g., more than 25 years or more than 100% of the optimal rotation age for that species)	1	3	3