German Environment Agency

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Funding climate-friendly soil management – key issues

Ex ante vs. ex post crediting[1]

1 Background

Definition: When mitigation is recognised and rewarded after it has occurred and been verified, this is referred to as **ex post**. However, in some mechanisms, actors are rewarded in advance for the expected level of mitigation their activities will lead to in the future (**ex ante**).

Importance: Ex ante crediting comes with risks of under-delivery (where the expected and credited mitigation is not achieved). There is also the risk that ex ante-approved mitigation may not be additional in the future (e.g. due to future regulatory changes) or that it may be double-counted if mitigation is later included in a cap-and-trade scheme. For these reasons, ex ante credits should not be used for offsetting in other sectors or locations. This generates uncertainty and the potential for low environmental integrity, so it needs to be critically assessed. Despite these downsides, ex ante certification is sometimes used in voluntary carbon markets for nature-based solutions, as ex post payments are considered insufficient to incentivise landowners to implement mitigation activities involving high upfront costs or long payback times (Cevallos et al. 2019).

Relevance: Either ex ante or ex post crediting can be used in any type of mechanism and to fund any type of mitigation action; this is an open design decision for the mechanism developer and therefore a relevant topic for all mechanisms, regardless of the sector (i.e. land use or other sectors). The risks of ex ante crediting are highest for offsetting mechanisms[2], where potentially uncertain or non-realised ex ante credits would substitute for mitigation in other sectors.

2 Key issues

Table 1 Ex post and ex ante crediting: Definitions and strengths and weaknesses

Ex post crediting	Ex ante crediting	
Ex post Actors are only recognised and rewarded for mitigation after it has occurred and been verified. This verification can be of differing stringency, depending on the mechanism and methodology, potentially including site visits, measurement and sampling, distance observation, or self-reporting. This may occur once at the end of the project, or	**Ex ante – differentiated credits** Actors who implement a mitigation action receive credits equivalent to their expected mitigation impact. However, these credits are marked as "non-verified", or are otherwise differentiated from standard credits. For example, mechanisms such as the Woodland Carbon Code and Gold Standard, create ex ante credits, which can be sold but not	**Ex ante – undifferentiated credits** The same as ex ante – differentiated credits, except actors receive standard credits (i.e. credits that are undifferentiated from verified, ex post-certified mitigation). This poses an increased risk to

[1] This factsheet was also published as part of the UBA report "Funding climate-friendly soil management", available at http://www.umweltbundesamt.de/publikationen/Funding-climate-friendly-soil-management.

[2] Under offsetting approaches, the buyer is using the certificates for mitigation outcomes as a substitute for within value chain abatement or mitigation activities in their own sphere and counts it towards their own (voluntary) climate target.

Ex post crediting	Ex ante crediting	
intermittently during the crediting period (e.g. every five years). Actors receive payment equivalent to the results achieved by their mitigation activities over the verification period.	retired as offsets until the projects have been verified, at which point the ex ante credits are transformed into standard credits (Cevallos, Grimault & Bellassen 2019).	environmental integrity, as buyers can use ex ante credits as offsets.
+ High certainty and environmental integrity, as mitigation is only recognised and rewarded when it has occurred and been verified. **- Slow payoff times** for actors implementing mitigation activities, as they must wait until mitigation activities have been verified. Given the slow and long-term nature of many soil-related mitigation activities, this can pose a significant barrier to uptake (Cevallos et al 2019). **- Higher transaction costs** for participants and administrators, due to strict verification requirements.	**+ Directly provides upfront funding[3],** which is important for mitigation activities that have slow pay-off times or require large upfront investment (e.g. agroforestry). **- Risk of under-delivery**, where the actual mitigation is less than the mitigation expected (and rewarded) ex ante, either due to underperformance or discontinuation of the mitigation activity, or due to future removals being non-additional owing to future regulatory changes. This risk is high for non-differentiated credit approaches, though somewhat lower for differentiated credit schemes. Under-delivery leads to low environmental integrity (where the total level of atmospheric emissions is higher than without the mechanism) and low cost-effectiveness. **- Poor reputation,** owing to the risk of under-delivery, associated with lower demand and lower prices for credits.	

Source: Authors' own compilation

3 Examples

Mixed crop-livestock systems refer to farm-scale systems where livestock and cash crop production are combined to optimise efficiency, commonly delivering mitigation through the application of livestock manure, perennial grasslands, and forage legumes.[4] A hypothetical climate-friendly soil mechanism could reward actors in advance for shifting to mixed crop-livestock systems based on an estimate of their expected net soil carbon accumulation and net emissions. **An ex ante system** would reward farmers up front, based on the estimated mitigation expected in the future. Given the complex nature of mixed crop-livestock systems, and the need to dynamically optimise farms to external factors such as changing prices and weather, an ex ante system would be very uncertain. **An ex post system** would reward farmers only once mitigation has been achieved and verified.

External inputs involve the application of off-farm organic nutrients or biochar to amend soil.[5] In an **ex ante** system, actors could be rewarded for biochar application upfront at a level equivalent to the amount of biochar they apply (and the carbon storage of that biochar), based upon assumptions about its residence time. An **ex post** system would require verification that the biochar has not degraded (or negatively affected soil carbon stored) before actors are rewarded.

4 Relevance for the EU

EU voluntary certification mechanisms: Existing voluntary carbon market mechanisms in the EU use both ex ante and ex post crediting systems.

[3] Upfront funding can also come through other means, e.g. through futures or other contracts; this also applies to ex post payment approaches.

[4] See factsheet on mixed crop-livestock systems, available at www.umweltbundesamt.de/publikationen/Role-of-soils-in-climate-change-mitigation.

[5] See factsheet on critical external inputs, available at www.umweltbundesamt.de/publikationen/Role-of-soils-in-climate-change-mitigation

- **Ex ante example:** The Woodland Carbon Code features differentiated ex ante credits ('Pending Issuance Units', PIU), which are awarded to validated projects based upon their expected mitigation; these credits are converted into verified credits once the mitigation has been verified. The ex ante PIU credits are effectively a promise to deliver mitigation in the future, and they cannot be used to offset other emissions until the mitigation has been verified. There are also limits on how buyers can communicate the purchase of PIUs (McDonald et al 2021).
- **Ex post example:** Verra (formerly Voluntary Carbon Standard) is an international voluntary carbon crediting mechanism covering many mitigation activities, including soil carbon sequestration methods. Actors only receive credits for mitigation activities following verification of their project and its results (McDonald et al 2021).

Common Agricultural Policy (CAP): Activity-based payments for implementing climate-friendly soil activities under the CAP are similar to ex ante payments with no verification; landowners are paid to implement activities that are expected to deliver mitigation, with no verification of actual results (Radley et al. 2021).

5 Addressing challenges

As explained in Section 2, **ex ante crediting creates risks for environmental integrity**. A number of potential solutions have been identified, such as **buffer accounts**, where certificates associated with a certain percentage of the expected ex ante mitigation are held back (e.g. 20%). This buffer is then drawn down to cover under-delivery of already credited projects. However, the simplest and best solution is to rely on the more certain ex post crediting, which does not pose the same risks as all credits are verified.

Some solutions have also been suggested to cover upfront costs or slow payback times, including mechanisms offering upfront support (such as training) and hybrid approaches, which consist of upfront payments with top-up ex post payments or adjustments based upon results achieved (Radley et al 2021). Alternatively, differentiated ex ante credits reduce the risks.

6 Relevant literature

Cevallos, G.; Grimault, J.; Bellassen, V. (2019): Domestic carbon standards in Europe Overview and perspectives (INIS-FR--20-0664). I4CE, France. Available at https://www.i4ce.org/wp-core/wp-content/uploads/2020/02/0218-i4ce3153-DomecticCarbonStandards.pdf.

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Umweltbundesamt
Wörlitzer Platz 1
06844 Dessau-Roßlau
Tel: +49 340-2103-0
Fax: +49 340-2103-2285
buergerservice@uba.de
Internet: www.umweltbundesamt.de
/umweltbundesamt.de
/umweltbundesamt

Authors, Institutions

Hugh McDonald, Ecologic Institute
Anne Siemons, Dr. Lambert Schneider,
Öko-Institut

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