Financial Instruments of Environmentally Friendly Solutions for Voluntary Carbon Offsetting

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Abstract: It is now recognized that social problems, including climate change and rapid urbanization, growing demand for food and water, as well as increased risk of natural disasters, can lead to abrupt and in some cases irreversible environmental changes that negatively affect human development. The traditional approach is to use engineering solutions that are designed and managed in such a way that they are easy to implement, easy to reproduce and provide predictable results, for example, large-scale physico-chemical biofiltration processes used to purify air and water. An alternative approach is to use nature based solutions (NBS) that use ecosystems and the services they provide to solve society's problems in sustainable ways. This work is devoted to the tools and methods of financing projects based on nature based solutions. Credit methods of financing projects for the decarbonization of society are considered, their features and specifics are revealed, types of standards for the implementation of credit offsets are determined. Corporate steps are proposed in order to achieve carbon neutrality based on the use of credit offsets.

1 INTRODUCTION

Nature based solutions (NBS) can mitigate 15 gigatons of carbon dioxide equivalent, or about 30% of the mitigation needed to achieve the goals of Paris Agreement. Despite the fact that public policy is necessary to support the use of nature to mitigate the effects of climate change, there is an investment gap between the amount of funds currently allocated for environmental protection and restoration and what is needed. For example, over the next decade, USD 65 billion is not enough just for forest conservation and restoration (Streck, 2021). Thus, a significant amount of investment can be attracted through voluntary carbon offsetting projects. The paper considers the concept of carbon sequestration and NBS to mitigate the effects of climate change, and also discusses the concept of voluntary carbon markets. Various existing standards of voluntary carbon offset are considered, and several types of offset projects are discussed. Finally, the role of carbon offset credits in achieving corporate carbon neutrality is considered.

2 MATERIALS AND METHODS

The paper considers the concept of carbon sequestration and NBS to mitigate the effects of climate change, and also discusses the concept of voluntary carbon markets. Various existing standards of voluntary carbon offset are considered, and several types of offset projects are discussed. Finally, the role of carbon offset credits in achieving corporate carbon neutrality is considered.

3 RESULTS AND DISCUSSION

3.1 Sequestration of Carbon Dioxide

Actions to mitigate the effects of climate change include not only reducing greenhouse gas (GHG) emissions in the energy sector through renewable energy sources or energy efficiency, but also biological mitigation of greenhouse gases, which can occur by preserving existing carbon pools and sequestration by increasing the size of carbon pools.

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Carbon sequestration is defined as the extraction of carbon dioxide from the atmosphere by soils and plants - both on land and in the aquatic environment, for example, in wetlands - and/or the prevention of carbon dioxide emissions from terrestrial ecosystems into the atmosphere (Zaitseva, 2018).

3.1.1 Ecosystem-based Mitigation of Climate Change

In the context of climate change mitigation, NBS is referred to as ecosystem-based climate change mitigation (EbM). EbM includes a variety of mitigation approaches, including sustainable forest management, the use of local communities of forest species in reforestation, conservation and restoration of peatlands and wetlands, protection of the ocean carbon sink, improved pasture management and environmentally sound farming practices. In addition to reducing GHG emissions, EbM provides a number of co-benefits, including:

- Reduction of health damage from air pollution
- Increased labor productivity due to reduced exposure to air pollution
- Increased satisfaction of the population from the improvement of the environment in connection with the reduction of emissions of pollutants
- Increased provision of ecosystem services by preserving and increasing forest cover and reducing emissions from deforestation and forest degradation
- Reduction of crop damage associated with ground-level ozone
- Increased agricultural productivity through the conservation and accumulation of carbon in the soil
- Less damage to coastal areas as a result of sea level rise
- Less mortality from heat as a result of reducing the number of heat strokes
- Less loss of biodiversity due to slower climate change.

3.2 Voluntary Carbon Markets

Carbon markets are institutions or systems in which parties exchange shares of carbon for compliance or voluntary use. Interests in carbon are either emission permits or credits. Emission permits are used in regulatory schemes that limit greenhouse gas emissions from certain facilities or sources. The emission of greenhouse gases from established sources is prohibited without a permit. The permit entitles the holder to emit a set amount of greenhouse gases, usually measured in tons of carbon dioxide equivalent (tCO2e), which is defined as "the amount of reduction in carbon dioxide emissions and carbon dioxide equivalent of other greenhouse gases and/or sequestration of additional carbon to compensate for emissions produced elsewhere" (Sapkota and White, 2020).

Voluntary carbon markets generate credits (or offset credits) that allow businesses, governments, non-profit organizations, universities, municipalities and individuals to offset emissions outside the regulatory regime. The offset is the emission of one metric ton of carbon dioxide or an equivalent amount of GHG. The buyer of an offset loan can "retire" him to claim emission reductions as part of his own GHG reduction goals. Credits are measurable, quantifiable and traceable units of GHG emissions. Currently, it is more cost-effective to use nature to absorb carbon from the atmosphere than to rely on artificial carbon sequestration plants or non-stationary GHG emission reduction technologies for industry.

3.2.1 Carbon Dioxide Emission Compensation Projects

Offset loans are mainly generated as a result of carbon offsetting projects in forestry, agriculture and "blue carbon" (IUCN, 2021). Known as biological binding, trees, plants and soil bind carbon, reducing its amount in the atmosphere. Biological sequestration projects usually include activities aimed at increasing sequestration or preserving existing sequestration capabilities that are under threat. In addition, compensatory loans can be obtained as a result of renewable energy projects, including the use of biomass fuels, and energy efficiency projects, including compensatory projects to modernize more efficient equipment and support more energy-efficient buildings. To qualify as a carbon offset project, it must reduce greenhouse gas emissions compared to what would otherwise happen. Equivalence between received (compensation) and lost (compensated emission) should also be ensured. The most important aspect of carbon compensation is the environmental integrity of the carbon compensation system. There are four main criteria that carbon offsetting projects must meet in order to ensure their environmental reliability and credibility:

1. Additionality: Compensation schemes typically use one or more of the following additionality tests:

- Checking for the additionality of emissions (or environmental additionality): It is assessed whether the project will lead to a reduction in

emissions compared to what would happen under normal business conduct.
- Regulatory additionality test: assesses whether the project is legally binding for its implementation by the author or another relevant party.
- Verification of financial (or investment) additionality: it is estimated whether the project will be carried out without the income received from carbon credits.
- Technological additionality: assesses whether the project leads to accelerated technology adoption, which would have occurred otherwise.
- Barrier testing: assesses whether any non-financial barriers may hinder the implementation of the project, for example, technological barriers or barriers in the capital market.
- Testing of common practice: assesses whether project activities are common practice in the region and/or industry.

2. Accurate measurement: The scheme accurately accounts for emissions and/or sinks occurring within the project boundaries as a result of project implementation, ensuring that there is no over-crediting (Lee and Kim, 2018; Miroshnichenko, 2021).

3. Leakage: The scheme should ensure that there will be no increase in emissions or reduction in uptakes beyond the project boundary as a result of the project (Gillenwater et al., 2017).

4. Consistency: Carbon accumulated and credited under the scheme will not be fully or partially released as a result of future events. The most common way to ensure consistency is:
- issuing only time-limited loans for sequestration projects when the loans expire after a certain period and they must be replaced upon expiration.
- the requirement to preserve carbon stocks for a fixed period of permanence, for example, 100 years (FAO, 2010).

3.2.2 Purchase and Sale of Offset Loans

In the carbon market, sellers and buyers exchange both permits and offset loans. In voluntary carbon markets, sellers of offset loans voluntarily reduce emissions or increase carbon sequestration, usually due to a financial incentive associated with the possibility of selling loans. Buyers who are not legally obligated to reduce emissions or increase carbon sequestration mainly purchase offset loans to reduce their environmental footprint, demonstrate corporate social responsibility and improve their public image. There are two main types of transactions in voluntary carbon markets:
- Forward sales: This type of sales corresponds to the sale of ex-ante emissions reductions (not released) before they occur or ex-post emissions reductions (released) that must be delivered after their release and the conclusion of the contract. Forward sales require agreement on a number of conditions, including the quantity to be bought/sold, the prices to be paid, payment terms, delivery of assets, which registry will be used, cancellation policy, etc.
- Spot sales: In this case, the seller delivers carbon compensation credits to the buyer's register, and then the buyer pays for the delivered carbon credits. Alternatively, the buyer can pay first and then the seller can make the delivery. Spot sales require the conclusion of contracts that address a number of issues, including the number of quotas to be bought/sold, the prices at which they will be paid, payment terms, termination terms, included and excluded taxes, etc.

3.2.3 Pricing of Carbon Offsetting Credits

In a functioning market with strict and transparent standards, the prices of carbon offset credits are set by supply and demand. The most successful will be those offset service providers whose projects are effective and can generate offsets at below-market prices. The carbon offset unit prices must offset the costs incurred at various stages of the project before the emission reduction can be sold as compensation. The main cost factors are:
- Costs associated with the project cycle: These costs include investments in technology, financing of investment capital, costs of technical operation of the project, maintenance and administration, etc.
- Costs associated with the delivery process: These costs include project management, quality control, legal and other costs.

3.3 Voluntary Carbon Offset Standards

Carbon offset credits sold on the voluntary carbon market can be certified according to a number of certification standards, the main of which are listed below. These standards ensure that carbon offsetting projects and the resulting credits are trustworthy.

Although each standard uses its own approach to measuring GHG reductions and absorptions, they all include criteria:

- definition of project categories and compliance with criteria
- additionality
- establishment of reference or baseline levels by which the reduction and absorption of emissions will be assessed
- monitoring of emissions and movements
- Risk management of the return of emissions into the atmosphere.
- Verification and certification
- Co-benefits for sustainable development - participation and consultation with stakeholders (Lovell, 2010).

3.3.1 Verified Carbon Standard

The Verra program or VCS certifies the reduction of carbon emissions. About 1,700 VCS projects have been certified under the VCS Program, which together have reduced or removed more than 630 million tons of carbon and other GHG emissions from the atmosphere. After projects are certified for compliance with the rules and requirements of the VCS Program, project developers can receive credits for greenhouse gas emissions, known as Verified Carbon Units (VCUs). These VCUs can be sold on the open market and used by individuals and companies to offset their own emissions. Projects can be developed in 15 sectoral areas of the VCS, including agriculture, forestry and other land uses (AFOLU). AFOLU project types include afforestation, reforestation and vegetation restoration, agricultural land management, improved forest management, reduction of emissions from deforestation and degradation, prevention of conversion of pastures and shrubs, and restoration and conservation of wetlands. The category of wetland restoration and conservation projects provides a framework for accounting for emission reductions in projects on mangroves, tidal and coastal wetlands, swamps, seagrasses, floodplains, deltas and peat bogs, etc.

In addition, the Climate, Communities and Biodiversity (CCB) Standards define projects that simultaneously address climate change, support local communities and small farmers, and preserve biodiversity. CCB standards are used in conjunction with AFOLU projects to certify the benefits of climate change, community and biodiversity. CCB standards ensure that projects:

- identify all interested parties and ensure their full participation
- recognize and respect ordinary and statutory rights
- take into account and control direct and indirect costs, benefits and risks
- identify and maintain high environmental value
- demonstrate net positive benefits for climate, community and biodiversity.

3.3.2 The Gold Standard

The Gold Standard (GS) company started its activity in 2003 with the aim of providing carbon credits and bringing them in line with the Millennium Development Goals. The company has developed more than 20 proprietary methodologies and is the

Table 1: Projects eligible for registration under the gold standard.

Project type	Description
Community service projects	These projects provide or improve access to services/resources at the household, community or institutional level, including: - Renewable energy sources connected to mini-grids or autonomous grids: Including solar, tidal/wave, wind energy, waste energy and renewable biomass. - End-use energy efficiency: Projects that reduce energy requirements compared to baseline scenarios without affecting the level and quality of services or products. - Waste management and treatment: All types of waste disposal activities that provide energy or useful products with benefits for sustainable development, for example, biogas. - Water, sanitation and hygiene (WSH): Activities in the field of WSH that contribute to climate change mitigation and/or adaptation.
Renewable energy products	GS projects must supply energy to the national or regional grid from renewable energy sources such as renewable biomass
Afforestation and reforestation projects	- These projects include plantings or project areas that are not defined as a forest and have not been a forest for at least ten years prior to the start of the project. - Projects may include planting trees (as well as shrubs, palm trees and bamboo), single-species plantations, all forestry systems, for example, conservation forests, and agriculture (agroforestry).

preferred standard for community-oriented projects. It maintains partnerships with Fairtrade International and the Forest Stewardship Council. In 2017, its rules and principles were brought into line with the Sustainable Development Goals. GS projects are aimed at accelerating the transition to climate security and sustainable development. The types of projects that can be registered with GS are listed in Table 1.

4 CONCLUSIONS

One of the main ways to combat climate change and environmental degradation for organizations is carbon neutrality. Carbon offset credits are a convenient and cost-effective way for organizations to reduce GHG emissions. Offsets are usually used to offset an organization's greenhouse gas emissions instead of directly reducing those emissions. Sometimes offsets are used to achieve carbon neutrality, that is, when the entire organization reaches zero net carbon footprint. The practice of voluntary compensation of emissions by organizations can lead to a number of advantages. To achieve carbon neutrality, an organization can take the following steps:

1. Reduce internal emissions: An organization can implement internal strategies to reduce emissions, such as investing in low-carbon capital projects, choosing low-emission alternatives when purchasing equipment, materials and fuels, as well as investing in energy efficiency measures and renewable energy sources on site.
2. Reduce emissions in the supply chain and products: An organization can estimate emissions in the supply chain and emissions from the use of products. It can then implement emission reduction strategies, including selecting suppliers with lower GHG supply chains, developing programs and incentives to help suppliers reduce emissions, and redesigning products with a lower emissions footprint.
3. Purchase of carbon compensators: An organization can purchase carbon offsetting quotas to offset any remaining direct GHG emissions and major sources of emissions from the supply chain and product use. In addition, organizations can enable interested consumers to purchase carbon quotas to compensate for a certain amount of carbon emissions.

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