Jurisdictional REDD+ methodology

BeZero Carbon Ratings



BeZero

Contents

Contents **2**
Glossary **3**
Introduction **5**
What is Jurisdictional REDD+? 5
BeZero Carbon Rating analytical framework and process for Jurisdictional REDD+ **7**
Holistic assessment 7
Carbon efficacy assessment **10**
Additionality 10
Additionality test 10
Activity analysis 11
Financial Analysis 12
Legal and Policy 14
Carbon Accounting 15
Direct accounting 15
Leakage 18
Permanence 20
Natural Risk 21
Anthropogenic risk 23
Beyond Carbon safeguards assessment **26**
Sources and limitations 27
Land and resource rights 27
Benefit sharing 28
Stakeholder engagement 28
Labour and livelihoods 29
Environmental safeguards 29
Appendix I: Sources as of October 2026 **31**
Geospatial data sources 31
Other third-party datasets 32
Literature sources 32
Appendix II: Additional reading **33**
Updates and reviews **34**

Glossary

Baseline: A baseline is the volume of emissions that are assumed to occur in the absence of any project intervention.

BeZero Carbon Rating (BCR): The BeZero Carbon Rating is a hybrid analytical framework that fuses financial, scientific, and policy-based analysis. It provides an opinion on the likelihood that a given credit achieves a tonne of CO_2e avoided or removed.

Buffer pool: The buffer pool is an account of non-tradable credits that projects contribute to and which serves as a communal reserve for Nature-Based Solutions. Contribution amounts are based on the methodology. If a project loses its carbon stocks, for example, to fire or disease, buffer pool credits can be used to compensate for the loss. Alternatively, projects that effectively mitigate the risk of carbon loss can regain the credits they contributed to the buffer pool.

Carbon finance: Financial resources allocated to carbon project activities that reduce or avoid greenhouse gas emissions. It is an additional source of revenue that seeks to make such activities more financially viable.

Carbon pool: Ecosystem components that release, sequester and/or store carbon. These include above- and belowground biomass, soil organic carbon, soil inorganic carbon, deadwood, litter and harvested wood products.

Commitment period: The duration or horizon over which a project commits to carbon sequestration or abatement as a result of project activities.

Deforestation: The intentional clearing of forests that changes land cover classifications.

Degradation: The loss or damage to small-scale forests that are insufficient to change land cover classification leaves land with the potential to recover.

Methodology: A framework that sets out a process and parameters for quantifying the carbon benefits of a project. Methodologies enable project developers to quantify baselines, assess key aspects like additionality, and define necessary monitoring practices to ensure the greenhouse gas emission reductions are verifiable, additional and quantified.

Nature-Based Solutions (NBS): Nature-Based Solutions aim to achieve emission removals or avoidance in the natural environment, including forestry, soil carbon, and blue carbon.

Rating Committee: A group of members with extensive experience within and across all sectors who discuss and debate the assignment of ratings. The Rating Committee oversees the analytical process and ensures consistency in applying ratings criteria, methodologies, and comparability of ratings across sectors and countries.

REDD: Reduced emissions from deforestation and forest degradation (REDD) was established by the United Nations (UN) to enhance forest carbon stocks in developing countries worldwide by preventing deforestation and degradation. REDD+ is a framework that builds on REDD's ambitions to conserve and sustainably manage forests and their carbon stocks. REDD+ activities are voluntary climate change mitigation mechanisms that seek to reduce anthropogenic pressures on forests.

Stakeholders: Individuals and/or groups of people who may be affected by the implementation and activities of a project.

Standards bodies: Organisations that develop and revise methodologies to determine the greenhouse gas benefits of various types of carbon programmes or projects, and inform when and how many credits programmes or projects can be issued.

Vintage: The vintage year refers to the period of time when the emission reduction or removal associated with a credit occurred.

Voluntary carbon market (VCM): Carbon markets that exist outside of the regulation and frameworks of international agreements, and are fuelled by commitments of individuals, as well as private and public organisations, to reduce greenhouse gas emissions by trading carbon credits.

Introduction

BeZero Carbon is the global ratings agency for carbon markets. Our ratings are a publicly available, risk-based framework for assessing carbon efficacy. We rate qualifying carbon credits in all sectors.

We use a research-first mindset, combining traditional capital markets research practices with environmental sciences and technology expertise. We think creatively about climate problems and build solutions the whole market can use.

We have developed extensive analytical frameworks to rate carbon credits' likelihood of delivering on their promised carbon emissions avoidance or removal. These analytical frameworks are deeply sector-nuanced and reflect our extensive experience rating hundreds of projects across dozens of sub-sectors.

Our ratings team is made up of c60 analysts who create the models and perform the analysis for every rating. They combine expertise in climatic, biological, and Earth sciences, in disciplines from remote sensing, forest ecology, ecosystem disturbance, peatlands and blue carbon through to statistics, machine learning, artificial intelligence, sell-side financial research, industrial engineering, and public policy. They hold over 20 PhDs, have published over 200 academic papers and have been cited over 10,000 times in peer-reviewed, scientific academic literature.

As the market's number one risk metric, our ratings are available on our website and dozens of marketplaces, and alongside extensive analysis and research on our BeZero Carbon Markets platform.

What is Jurisdictional REDD+?

BeZero Carbon's Jurisdictional REDD+ (J-REDD+) methodology is a tool for users of the BeZero Carbon Rating to better understand our multifaceted ratings approach to the sub-sector.

Emerging from the United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP), Reducing Emissions from Deforestation and Degradation (REDD+) is a collection of activities and recommendations designed to encourage and motivate the protection of forests globally. Jurisdictional REDD+ (J-REDD+) is the application of this framework and programmes of activities at the scale of a legally defined territory or jurisdiction, which may be national or subnational (e.g., state; discussed on our platform), as opposed to narrowly circumscribed project areas.

In the Forestry sector, credit issuance can be broadly classified as both avoidance and removal. J-REDD+ methodologies primarily focus on avoidance credits, although if certain activities occur within a jurisdiction, some methodologies permit removal credits to be issued.

In the BeZero Sector Classification System, we classify J-REDD+ programmes and activities within a separate subsector within the Forestry Sector, which falls within the Nature-Based Solutions (NBS) Group. Some risk drivers are labelled differently due to the nature of the programme vs. project REDD+. J-REDD+ is one of five Forestry sub-sectors within the Nature Based Solutions (NBS) sector group (Figure 1).

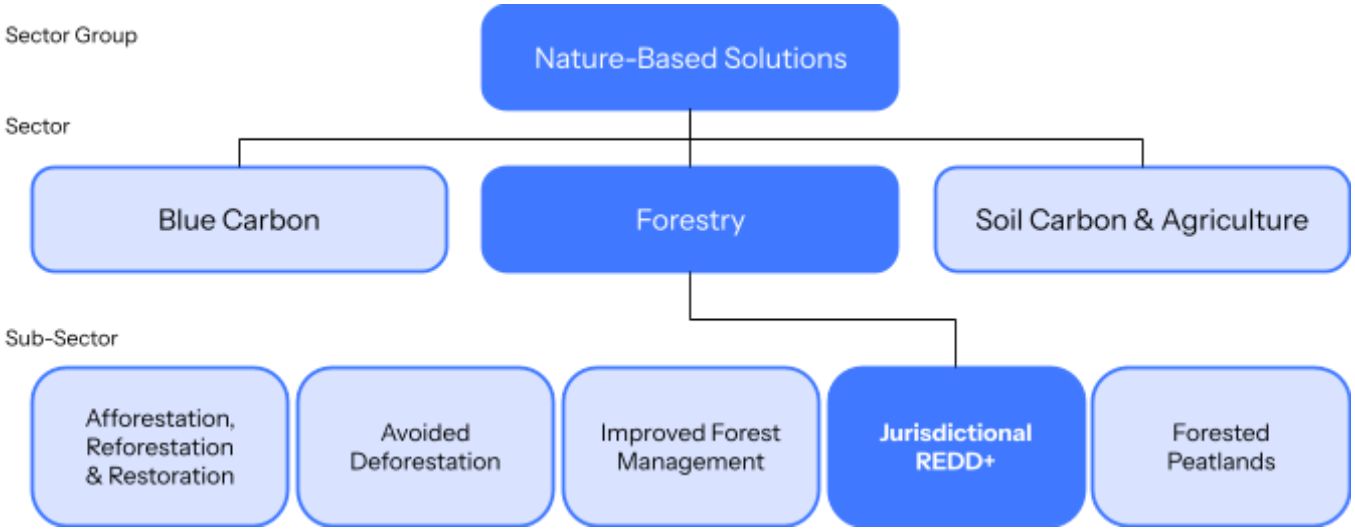


Figure 1. The location of the Jurisdictional REDD+ sub-sector within BeZero's Sector Classification System.

J-REDD+ includes a range of REDD+ readiness, implementation, and results-based payment activities, typically financed through bilateral and multilateral agreements or carbon credit sales. These government-led activities may include developing forest reference levels. However, such initiatives have not always generated credits or received market-based payments. In this methodology, J-REDD+ encompasses a complex set of policies and market mechanisms that protect a substantial fraction of a jurisdiction's forested area.

Under Article 6 of the Paris Agreement, countries can use market-based mechanisms to trade or transfer emissions reduction units (ITMOs) from REDD+ projects with other countries or VCM standards and participants. There is no methodological exclusion of REDD+ activities from future Article 6.4 frameworks. These REDD+ activities and Article 6 REDD+ credits can generally be described as 'sovereign J-REDD+', because the programmes that produce them usually involve governments at different jurisdictional levels, and a different regulatory approach addresses the legal and policy aspects of these credits.

The BeZero J-REDD+ rating methodology applies only to sovereign J-REDD+ programmes and credits issued directly by national or subnational governments (e.g., via the Forest Carbon Partnership Facility), or under standards such as ART-TREES and Verra's Jurisdictional and Nested REDD+, provided they meet our minimum requirements. Individual project-level REDD+ credits that use jurisdictional or nested accounting approaches, such as Verra's VM0048 methodology, remain classified under and assessed using BeZero's Avoided Deforestation Methodology.

BeZero Carbon Rating analytical framework and process for Jurisdictional REDD+

We have designed an approach to assessing the carbon efficacy risk for issued carbon credits. This framework is applicable to any project or programme type in any sector accredited by any standards body, and leverages a blend of qualitative and quantitative factors; financial, environmental, policy assessment techniques; and primary and secondary data sources.

Our BeZero Carbon Rating Methodology details our risk-based assessment for understanding and interrogating the efficacy of issued carbon credits of any type, in any sector and country.

The BeZero Carbon ex ante Rating Methodology similarly describes our framework for assessing carbon efficacy of credits yet to be issued from projects or programmes of any type, in any sector and country. Ex ante ratings will also consider project or programme execution risk.

Sector methodologies can be seen as nested within the overarching ex post or ex ante methodologies. The overall rating definitions, risk factors and risk driver categories are common across all projects and programmes while the sector methodologies complement the overarching methodologies.

This document extends our overarching rating methodologies. It presents BeZero's detailed analytical framework and process for J-REDD+ programmes. It showcases the various parameters through which we assess risk to the carbon quality of these credits, and how this sub-sector relates back to our overarching ratings methodologies.

Holistic assessment

The assessment of a carbon credit's efficacy includes a detailed, project- or programme-specific, bottom-up, and top-down analysis, to provide a comprehensive assessment of risk. Further details on the risk factor definitions, the rating process, and the overall risk assessment can be found in our BeZero Carbon Rating Methodology. For pre-issuance ratings, please consult the BeZero Carbon ex ante Rating Methodology.

Important elements of the BeZero Carbon rating process that are applicable to all project or programme types are described in detail in these documents (but not repeated in this document). These include:

- The steps in the rating process
- The project or programme governance assessment
- Project or programme boundary auditing
- Assessing the risks of double counting
- The integrity of reported issuance
- Assessing rating eligibility (whether projects or programmes meet our three primary qualifying criteria)
- The rating assignment process
- The role of the BeZero Carbon Rating Committee
- Ongoing monitoring and 'rating watch' process

Geospatial and Earth Observation

For all NBS projects and programmes, data and analysis from our Geospatial and Earth Observation team forms a core part of the analytical process. The team draws on a diverse set of data inputs, including but not limited to airborne and spaceborne LiDAR, synthetic-aperture radar, and multispectral measurements, with spatial resolutions ranging from centimetres to kilometres, and temporal frequency and coverage from days to decades.

Other geospatial inputs include data on road and river networks, human demographics, land ownership and governance, soil and climate data, and biodiversity. We also draw on our extensive database of ground-measured carbon, spanning thousands of forest inventory sites globally. These geospatial data are combined in statistical and machine learning frameworks to inform programme- and vintage-level risk associated with common practice, over-crediting, leakage and non-permanence.

Three geospatial capabilities are central to our current J-REDD+ analysis and are referred to throughout this document.

1. **Statistically-matched dynamic baselines and programme performance.** Constructing dynamic baselines for entire jurisdictions is fraught with uncertainty and strongly constrained by the donor pool. This is because of the complexity of matching governance across different countries or subnational jurisdictions. However, this does not preclude the use of statistically-matched dynamic baselines to examine the effectiveness of specific interventions within a jurisdiction (where appropriate). For example, if policies are aimed at reducing emissions from forest concessions, we can select donor pixels in non-concession forest areas that are closely related in non-governance parameters to examine the policy's impact. Because there is no perfect set of controls, we repeat the matching process many times to characterise uncertainty, and we track outcomes in matched pairs through time. This procedure is led at every stage by our geospatial and ratings analysts, so that models do not become black boxes, and analyst feedback is incorporated to ensure conclusions are grounded in ecological reality and in the local context of the project being assessed.

2. **High-frequency forest carbon and emission monitoring.** Through our partnership with Planet Labs, we use Forest Carbon Diligence and Forest Carbon Monitoring products to observe canopy cover, canopy height and aboveground carbon density at high spatial resolution and regular temporal frequency. We also leverage our partnership with Chloris Geospatial to estimate changes in biomass in a jurisdictional boundary through time. This allows us to detect areas of forest cover loss and partial-canopy events such as degradation, which are poorly captured by conventional tree cover loss products and are central to estimating total emissions in J-REDD+ programmes. We are explicit about the limitations of these data, and given the scale of jurisdictional programmes, there is high variability among publicly available and private datasets. As a result, we also attempt to leverage nationally produced data and aim to reconcile the differences amongst tools to present a reasoned assessment of the programme's emissions and forest change.

3. **Forest inventory integration.** We maintain the BeZero Carbon Plots Database, which combines ground-measured carbon from private collections, national inventories, international plot networks, academic studies and research partnerships, spanning more than 300,000 sites across all six forested continents as of September 2026. It harmonises stem-level estimations of tree volume and species-specific wood density, linked with

allometries, geospatial information and our market data. Specifically for J-REDD+ programmes, we incorporate data from South American national forest inventories, as well as funding or supporting data collection campaigns in South America and Africa. These data allow us to benchmark programme-reported carbon stocks and root-to-shoot ratios against measured values for comparable forest types in the programme area or in regionally appropriate ecoregions. Where national inventories are absent or otherwise unreliable, our analysis is driven by literature values and, where appropriate, remote sensing.

The BeZero Carbon Rating reflects the balance of evidence across all types of information, geospatial or otherwise. Subject to project- and programme-specific characteristics and evidence, our geospatial analysis may not be paramount in the final rating view if, for example, financial, policy or other analysis is deemed more decisive. In all cases, non-spatial data - for example buffer pool contributions - provide essential context. Where the quality of matching or of the underlying data is insufficient to support a conclusion, we say so and weigh the evidence accordingly rather than relying on it.

Carbon efficacy assessment

Additionality

'The risk that a credit purchased and retired does not lead to a tonne of CO_2e being avoided or sequestered that would not have otherwise happened.'

Whilst the foundational questions that underpin a BeZero Carbon Rating converge at the risk factor level, the inputs used to answer these questions show increasing specificity at the sub-sector and programme levels.

Table 3 sets out the risk drivers within our assessment of additionality. In the sections that follow, we detail the key parameters that factor into each level of risk assessment.

Table 3. Sub-components of additionality assessed.

Risk factor	Risk driver category	Risk driver
Additionality	Additionality test	Appropriateness of tests
	Activity analysis	Historical Activities of the jurisdiction
		Alternatives to the proposed programme
		Programme effectiveness
	Financial analysis	Carbon finance and financial flows
		Barrier analysis
	Legal and Policy	New, sustained, changed, or ended political actions
		NDC and national climate action

Additionality test

We always independently assess a project's or programme's additionality, irrespective of the results of methodologically mandated additionality tests. This approach allows us to assess the effectiveness and integrity of additionality claims otherwise granted by standards bodies on an automatic, qualitative, or unsubstantiated basis. For J-REDD+ programmes, our assessment is no different.

Additionality requirements differ across standards, sectors, and methodologies, with some project types eligible for automatic additionality if they meet specific pre-defined criteria. In some cases, standards bodies exempt these projects from formal testing. At a jurisdictional scale, additionality testing is often difficult to operationalise because the tests are deemed inappropriate for a sovereign jurisdiction seeking funding to sustain high-quality forest management practices. Seeking financing for forest protection implies that the programme's purpose is to support business-as-usual conservation practices. As a result, some participating entities may not have to pass traditional additionality tests, with programmes deemed automatically additional based on historical 'baseline' setting (Performance Benchmark tests; see Carbon Accounting section) or by qualifying as a jurisdiction with High Forest Cover/Low Deforestation (HFLD).

Therefore, we go beyond the automatic additionality qualifiers and examine all aspects of potential additionality that a programme may present.

Activity analysis

Historical activities of the jurisdiction

Our assessment of historical activities examines the extent of a proposing government's forest management activities before accessing carbon finance for the specific programme of activities considered by the rating.

To do this, we leverage our internal markets and geospatial databases to assess the prevalence of forest protection, harvesting, and conversion in the jurisdiction in question. Especially important for J-REDD+ programmes is their engagement in REDD+ readiness funding or other results-based payment schemes. We examine historical engagement and action with such programmes and their effectiveness. Transitioning among different but fundamentally carbon-financed schemes may not be considered a risk to additionality.

For jurisdictions meeting the HFLD criterion, we adopt a slightly different approach. In these cases, it is important to consider the range of activities and the jurisdiction's ability to enact them to promote positive climate outcomes. For example, we consider whether adding carbon finance in the specific instance will likely enable better protection, or if programmes continue a jurisdiction's business-as-usual practices. Also, we examine whether non-market financing initiatives, before the introduction of carbon finance, could ensure the jurisdiction retains its forest cover. Finally, in some specific instances, we compare historical trends in regionally similar jurisdictions to determine whether forest retention reflects proactive climate governance or the absence of economic or demographic drivers of deforestation.

Alternatives to the proposed programme

Demonstrating a strong counterfactual scenario, against which a programme is acting to reduce emissions, is crucial for additionality.

J-REDD+ programmes must accurately identify the primary emission sources within their jurisdiction to ensure that policies and activities implemented under the jurisdictional programme are targeted and effective. For instance, if we perceive agricultural expansion as a primary driver of deforestation, policies implemented as part of the J-REDD+ programme of activities should identify and alleviate the key stakeholders driving land conversion. Economies heavily reliant on one or a few commodities may be particularly exposed to global price fluctuations. In such cases, how a jurisdiction plans to transition that sector away from generating further emissions if prices rise is key. A lack of evidence regarding adaptation or compensation to perceived drivers of emissions may raise concerns about the baseline scenario and planned mitigation activities. We examine in detail a jurisdiction's J-REDD+ or development strategy (including past iterations) to see how it articulates its view of the future theory of change and how it will address it by initiating or continuing policies, legislation, or other levers. Where relevant, we also consider how prices of key emission-producing commodities changed during rated vintages, and whether historical patterns of emissions changed relative to before the programme's initiation.

The pressure to exploit existing forest resources is particularly prevalent in HFLD jurisdictions, where forests may be under increasing threat due to their economic value (e.g., timber, mineral extraction).

While the direct revenue to governments from developing these resources may be small, larger socioeconomic benefits to the economy (and tax receipts) may be large. Conversely, the jurisdiction's historical activities may already be sufficient to prevent deforestation. Still, internal and external pressures on the government may be growing due to the desire for development. We assess alternatives to the programme in light of all of these factors, drawing an independent view on drivers of emissions and mitigatory activities implemented to reduce their impact.

Programme effectiveness

A key metric in our additionality assessment of jurisdictional programmes is the extent to which implemented activities and policies have effectively reduced emissions. We evaluate programme effectiveness by comparing post-implementation emissions rates to both the jurisdiction's historical reference period and our independently modelled business-as-usual scenario.

For example, suppose the rate of forest loss and emissions decreases or increases at a different rate from the historical context or a credible baseline scenario. In that case, this can serve as a useful indicator of programme effectiveness. Critical to this evaluation is the cause-and-effect nature of changes in emissions within the jurisdictional boundary, and whether they can be attributed to jurisdictional activity or to natural variation exogenous to the control or actions of the sovereign. If this link can be established, notwithstanding other considerations (e.g., financial analysis), this can indicate that the programme of activities is additional and effective. We also explore the targets and aims of the J-REDD+ or development strategy that emission levels do not adequately capture (e.g., the expansion growth of protected areas or capacity building), identifying key metrics a jurisdiction has outlined and their effectiveness against their targets. Conversely, where deforestation rates and emissions are stable or rising for an extended period, this may suggest that the programme has not yet had any material effect, presenting an additionality risk.

Financial Analysis

Carbon finance and financial flows

The potential financial benefits a jurisdiction could generate, or that forest stakeholders within a jurisdiction could receive, from forest clearance will outweigh nearly all conservation pathways. Our assessment of J-REDD+ financial additionality tries to unpick whether carbon finance has driven top-down decisions and policies. It is also important to assess the level of transparency and accountability in the carbon finance a proponent has developed, and whether the addition of carbon finance is likely to reach activities with a demonstrable impact on climate-related governance.

To make this assessment, we investigate government budgets (where possible) to gauge whether the proponent has sufficient resources allocated to address deforestation or whether carbon finance is needed to augment these. We also examine whether other funding sources or government income are available, as financial additionality requires demonstrating that the proponent could not otherwise substitute carbon funds. In some cases, the J-REDD+ programme may have leveraged additional investment from private entities or international donors that would not otherwise have been mobilised.

Beyond examining the price and number of credits a jurisdiction issues, it is important to understand the actual revenue received by the host sovereign. Examining the exact level of revenue matters because implementing a J-REDD+ programme involves substantial costs. These costs primarily stem

from transaction costs, where the time and costs of becoming a validated programme can be high. Also, the fixed prices agreed upon by the jurisdiction and the standards body upon implementation may not accurately reflect the carbon price it could achieve on the open market in the future. If insufficient, carbon credit revenue may leave the programme underfunded or unable to reach its outlined goals.

From a top-down perspective, we consider several indicators to examine the likelihood of additionality concerning financial flows. For example, we can look at indices of corruption in the jurisdiction from independent metrics such as Transparency International's Corruption Perceptions Index. If the jurisdiction has a history of receiving donor funding for climate change or otherwise, we can examine case studies on the effectiveness of implementing these sources of income. At a more programme-specific level, we consider whether the jurisdiction has allocated monies received for a specific cause in initial programme proposals, and whether there is substantive evidence of these transfers having occurred. If the allocation of carbon finance revenue is not specific, we may be able to assess whether funds have flowed to projects intended to enable or assist the programme's activities. Finally, the programme must include Indigenous Peoples and local communities (IP and LCs). We assess whether the programme includes mechanisms to appropriately compensate IP and LCs for their stewardship of the land and whether capacity-building efforts enable these communities to manage and equitably distribute funds to their members.

Barrier Analysis

Many barriers inhibit initiating emission reduction activities at a jurisdictional scale, often unique to an individual jurisdiction's specific circumstances. Barriers can include, but are not limited to, institutional capacity, government and stakeholder opportunity cost, the cost of activity implementation, technical feasibility or skills of the population or government, and cultural or perceptual barriers to change.

The opportunity cost of emissions reductions is often the largest barrier to jurisdictions implementing J-REDD+ activities. The forgone revenue can be for the government through licences or tax receipts, but mainly for stakeholders who work to extract resources from forested environments. The extent to which carbon finance revenue can offset government revenue, fund policy enforcement, and support stakeholders' livelihoods is important for our assessment of additionality.

A key element prohibiting the development of J-REDD+ programmes is the strength and breadth of institutional capacity. This represents a barrier to implementing J-REDD+ activities because the complexity and scale of their deployment require significant intra-governmental cooperation, which may be lacking before the receipt or promise of carbon finance. We examine the extent to which institutional capacity existed before carbon finance was received, and how implementing organisations used revenues to build this capacity.

Many countries developing J-REDD+ programmes lack the technical expertise to deploy or monitor a programme at scale without additional funding from carbon finance revenues. Similarly, the stakeholder populations may be unable to enact activities on the ground without substantial training or technological support from the government. As a result, overcoming these barriers is a key element of additionality for J-REDD+ programmes of activities, and we explore how funds have been used to address such risks.

Legal and Policy

New, sustained, changed, or ended political actions

In some J-REDD+ programmes of activities, the introduction, modification, or termination of specific policies and regulations forms a major pathway for reducing a jurisdiction's emissions. Therefore, as part of our policy assessment, we examine how the historical policy backdrop within the jurisdiction conflicts with the existing or proposed J-REDD+ activities. Where favourable policy conditions existed before the programme's launch, we assess whether these activities could have been implemented without carbon finance. In particular, we will consider the existence and relevance of forest- and emissions-related policies, and when the jurisdiction implemented them, in the context of the J-REDD+ programme start date. Any new, sustained, changed, or ended policies must address emissions appropriately.

Beyond laws and legislations of jurisdictional governments, we also assess the extent to which implementing agencies (e.g., forest or natural resource ministries or departments) have changed codes of practice or operating procedures to enhance the implementation of the J-REDD+ programme of activities during the rated vintages. Our assessment can also include examining the extent to which a proponent has funded technical staff training and recruitment, or technology employed to help the agency implement the programme of activities.

In sub-national jurisdictions, we can also examine whether the jurisdiction's actions align with nationwide climate, forest, and emissions objectives. A very supportive national policy environment could undermine the additionality of J-REDD+ activities, unless it is demonstrably not achievable at the national level, or is the mandated responsibility of the sub-national governments. Conversely, implementing policy action in an unsupportive national environment, where prevailing national policy and regulatory decisions run counter to the aims and objectives of the subnational sovereign, may support the carbon efficacy of any claimed emissions reductions.

NDC and national climate action

Assessing the jurisdiction's nationally determined contribution (NDC) is a major factor in our top-down policy analysis for J-REDD+ programmes. The NDC refers to the conditional and unconditional commitments made by each participating country to outline its efforts to mitigate greenhouse gas emissions and adapt to the impacts of climate change. A country's J-REDD+ programme is closely tied to the land use and forestry section of its NDC, which reflects its commitment to mitigating greenhouse gas emissions and adapting to climate change impacts. Our analysis focuses on the forest-related conservation goals outlined in the country's NDC and the implementation and monitoring strategies employed to achieve these targets. Importantly, many NDC targets and goals are conditional, meaning the jurisdiction can only reach them with support from other nations. Carbon finance could help fill this gap. Where unconditional commitments are made in the NDC that the jurisdictional programme then claims under a J-REDD+ programme of activities, or when the programme of activities conflicts with the NDC, we may view there to be a risk to the additionality of the programme. This assessment allows for insights into the alignment of J-REDD+ with national climate goals, particularly how the country's climate change mitigation and adaptation efforts prioritise forest-related measures.

For sub-national jurisdictions, we explore the extent to which a national NDC is conditionally or unconditionally dependent on the resources within that jurisdiction and the support the national government provides to the programme to fulfil its obligations outside of the J-REDD+ programme.

Carbon Accounting

The risk that more credits are issued than tonnes of CO_2e achieved by a given project and fewer tons of CO_2e than claimed, may be avoided or removed.

Table 4 sets out the risk drivers within our assessment of carbon accounting.

Table 4. Sub-components of our Carbon Accounting assessment.

Risk factor	Risk driver category	Risk driver
Carbon Accounting	Direct accounting	Baseline/emissions reference level
		Crediting level adjustments
		Programme scenario
		GHG conversions
		Uncertainty assessment
		Accounting boundary, nested projects, and corresponding adjustments
	Leakage accounting	Activity displacement
		Market leakage
		Ecological leakage

Direct accounting

Baseline/emissions reference level

The carbon accounting risks in J-REDD+ programmes of activities can be assessed by evaluating the baseline or crediting level used to determine credit issuance, before any adjustments are applied. This includes analysing how the rated vintages compare to the historical reference period, focusing on factors such as shifts in emissions drivers, changes in natural conditions (e.g., climate variability or ecological disturbances), the duration and representativeness of the reference period, and the approach used by the programme to estimate emissions.

We examine the reference periods used to develop J-REDD+ baselines to assess whether they sufficiently capture plausible future forest emissions or forest loss rates for the jurisdiction. Most jurisdictions use at least three time points to establish a crediting baseline, and we assess whether this historical period may lead to overestimated baseline deforestation rate estimates. Important changes for jurisdictional programmes include governance changes or shifts in market dynamics, which may not reflect the current or future environment. A programme's performance may appear enhanced compared to its historical reference period due to changes in natural climate dynamics, rather than causal emissions reductions from carbon finance.

We assess how often emissions levels are reassessed or updated. This is important because several dynamic factors – including social and economic shifts, population growth, policy reforms, technological change, and commodity market demand – can rapidly influence deforestation drivers. As these pressures evolve, emissions forecasts must be adjusted to remain relevant and accurate.

Also, we assess the predictive approach some J-REDD+ programmes use to estimate future forest emissions or deforestation trends, against which programmes calculate verified emissions reductions. Some J-REDD+ programmes may use a simple linear regression approach that projects trends in historical deforestation and emissions into the future. Other jurisdictions may estimate the historical average emissions rate over a fixed look-back period.

Furthermore, the large spatial scales considered for jurisdiction-level crediting warrant special consideration of the modifiable areal unit problem. The modifiable areal unit problem occurs when the results of spatial analyses (e.g., forest loss) change with the size of the study area. Similarly, scaling small-scale effects to large areas where agents and drivers of forest loss and emissions are diverse can dramatically increase prediction uncertainty. As such, one baseline model may not be appropriate when extrapolated to the entire jurisdiction. In some programmes of activities, programmes could exploit this artefact to permit the issuance of more emissions reductions or removal units than otherwise possible.

Crediting level adjustments

Some jurisdictional crediting programmes permit adjusting the number of credits issued based on prescribed criteria. The adjustment is because historical emission levels may not represent business-as-usual emissions if a programme ceased J-REDD+ activities. One example is the High-Forest Low-Deforestation (HFLD) adjustment applied to some programmes of activities that issue credits under. Programmes deemed to have high levels of forest cover and low deforestation (HFLD) rates have their reporting-period performance assessed against an elevated reference emissions level.

Since credit issuances from programmes of activities to which this methodology applies are to be used to offset real emissions, the adjustments to crediting must represent real and actual carbon benefits. If they do not, such adjustments may substantially increase the overall carbon accounting risk. BeZero's approach is to examine such an adjustment on a case-by-case basis to assess the appropriateness of all crediting adjustments. We inform our view using a combination of evidence, including, but not limited to, an independent assessment of historical and programme period activity, forest biomass and biomass changes, and plausible counterfactual scenarios established during our evaluation of additionality.

Programme scenario

J-REDD+ programmes must accurately account for emissions that occurred during the monitored period. Assessing how this activity is accounted for is fundamental to determining the carbon efficacy of emissions reductions or removals in a crediting programme.

In jurisdictional programmes, the broad suite of agents and drivers means that the atmospheric impact of addressing one type of land use/land cover change may differ. Therefore, we explore in detail the level of emissions for each activity claimed by the jurisdiction, comparing it to our assessments made using temporal satellite imagery with high spatial resolution, and those available from other sources (with careful consideration of the various definitions and variables used when making the comparison).

We address the nature, timing, and appropriateness of policy and regulation changes enacted by a jurisdiction due to a J-REDD+ programme of activities in Additionality. In Carbon Accounting, we assess the impact of such regulations on carbon stocks in the jurisdiction to the extent possible. One

simple example of a policy action might be a moratorium on harvesting and degradation in protected areas. Here, we would deploy our state-of-the-art forest loss and degradation detection tools to confirm that the estimates made by the programme align with our own. In more complex and multi-faceted policy instruments, we determine potential confounding variables and the true impact policies have had on reducing emissions covered by the programme.

Some jurisdictional programmes include crediting for removals or carbon stock enhancements, calculated separately from avoided emissions. Jurisdictions may only claim removals when total emissions fall below the crediting level. As with assessing the extent and success of avoidance activities, our assessments of removals encompass a mix of geospatial and Earth observation data. These include high-resolution canopy height monitoring in planted areas, satellite-derived biomass increment assessments, Normalised Difference Vegetation Index data, and the BeZero Carbon plots database.

GHG conversions

We assess how a programme translates deforestation and degradation activity into emissions. Our assessment includes the inclusion/exclusion of carbon pools, the programme's assessment of biomass, and the activity emission factors applied.

Our assessment considers forest stratification, the number, location (if available), and sampling of biomass plots. We also examine the allometric equations used, how jurisdictions established them, and how they compare with other plausible alternatives. To make this assessment, we use an array of literature sources, the BeZero Carbon Plots Database, and several remotely sensed biomass estimates that provide both time series data and point-in-time assessments.

Our assessment of carbon efficacy requires careful consideration of converting activity to atmospheric impact. At a high level, the atmospheric effect of an activity within the jurisdiction is calculated by:

$$Atmospheric\ Impact\ =\ Activity\ Unit\ \times\ Emission\ Factor$$

In J-REDD+ programmes, the range of activities that can result in atmospheric emissions being reduced or prevented due to the programme's activities is greater than in project-level accounting. For example, the atmospheric impact of forest conversion to agriculture may not have the same climate impact as losing the same forest to mining. Appropriateness of the applied emission factors includes whether the programme collected them or used methodology or IPCC default values (and whether more updated values exist since application), and, where possible, our in-house determination of such factors. Further conservative approaches include correcting past emissions reductions in response to developments in scientific understanding of activities and their emissions.

Uncertainty assessment

The crediting calculations of many J-REDD+ programmes contain adjustments to final issuance due to the inherent uncertainties associated with measuring emissions. Some of these approaches are more robust than others, and we take a programme-by-programme view on whether uncertainty adjustments have been adequately made, including the methodology and magnitude used to calculate uncertainties.

Accounting boundary, nested projects, and corresponding adjustments

We independently validate all programme boundaries, including the whole jurisdiction, a specific or combination of biomes/ecozones, or a forested area using a specific forest definition. We investigate the reasons for excluding certain areas of accounting (e.g., forest definitions at specific points in time) to determine whether the jurisdiction has appropriately considered all areas that proponents could conservatively include in its programme of activities. In some instances, the inclusion of only some subnational regions may be because this is where emission or forest inventory data are collected, or to avoid double-counting within existing programmes. Our assessment will consider whether the jurisdiction has selected areas to take advantage of crediting level adjustments. Similarly, over-categorising forests and ecoregions within a jurisdiction (i.e., increasing the number of different units) can create carbon efficacy risks by increasing apparent forest loss rates and reducing the area where deforestation activity is applied.

The sovereign nature of J-REDD+ programme proponents means that any emissions reduction or removal claims traded outside United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement schemes (i.e. on the Voluntary Carbon Market) must be sufficiently accounted for to prevent double claiming. Similarly, nested projects already operating within the jurisdiction must have their emissions avoidance appropriately deducted from the jurisdiction's final credit issuance under the J-REDD+ methodological frameworks. Sometimes, we may have assessed the carbon efficacy of nested projects within a jurisdiction. From these assessments, we can comment on the magnitude of the issuance deduction made by the J-REDD+ programme for the project in question. For example, suppose credits between a project-scale methodology and a jurisdictional programme methodology are considered like-for-like, but we have assessed significant carbon accounting risk in the project. In that case, the 1:1 relationship will likely result in a deduction from the J-REDD programme that does not represent the true atmospheric carbon impact. Such considerations could positively and negatively impact the rating of the J-REDD+ programme.

Leakage

The carbon accounting risks of J-REDD+ programme activities also depend on identifying and quantifying leakage risks. We consider activity shifting, market, ecological leakage, and the magnitude of the leakage deduction applied. Of particular importance is how programmes consider emissions leaked internationally.

The interconnectedness of global markets for many commodities means emissions reductions in one country could increase emissions in another, and we assess this risk across all rated projects where applicable. J-REDD+ methodological approaches consider international leakage emissions differently. For example, Verra's VCS Jurisdictional and Nested REDD+ (JNR) includes considerations of international leakage through its VCS JNR Leakage Tool (Section 3.4 of the JNR Program Description, v3.2). However, ART TREES excludes international leakage considerations because it views worldwide national-scale accounting as sufficient to track emissions, and deducting leakage would create double-counting (albeit conservatively). While not required by the UNFCCC for Article 6.2 transactions, the latest UNFCCC standard for Article 6.4 requires that the scope of leakage consideration *'not be limited to national boundaries and shall include international leakage'.* This decision may signal a shift towards accounting for international leakage across J-REDD+ methods. In light of these factors, we include an assessment of international leakage in our J-REDD+ methodology.

Activity displacement

Activity displacement is the local displacement of the drivers and/or agents of deforestation due to the implementation of Avoided Deforestation activities. In national jurisdictional-level accounting, activity displacement within the jurisdiction is encompassed by the scale of the accounting boundary, meaning there is no deduction for leakage from issuance. There is no discount because programme monitoring and reporting protocols capture all agents of forest loss, their activities, and where their activities are displaced, provided that most of the jurisdiction's forest falls within the programme's accounting boundary. For subnational J-REDD+ programmes, we assess the magnitude of the leakage estimate, how it was determined, and mitigating activities put in place by the jurisdiction to mitigate this risk.

One example where zero leakage deduction for national-level accounting is inappropriate is when transboundary migration is very weakly monitored or controlled due to remoteness or international agreement. Alternatively, jurisdictional governments may change policy and regulation such that some agents of deforestation (e.g., a global mining or agri-food company) migrate internationally and restart or expand their activities elsewhere. Because this would involve the same agents of deforestation, it would represent an unmitigated risk of activity-shifting leakage.

Market leakage

Market leakage occurs when Avoided Deforestation activities alter the supply and demand equilibrium of a commodity or activity. By implementing a J-REDD+ programme, a jurisdiction could shift market dynamics such that market activities elsewhere reverse the emissions avoided or removed by the programme's interventions. In a jurisdictional programme, shifting commodity production to another regional or global location can entirely reverse the emissions avoidance of a programme of activities, considering carbon dioxide flows to the atmosphere. Producing commodities (e.g., palm oil, cattle, coffee) often leads to high levels of market leakage. In addition, the global, dynamic, and highly interconnected nature of the timber market also exacerbates the risk of market leakage for both project activities and J-REDD+ programmes of activities.

Quantitatively assessing market leakage is challenging at the jurisdictional scale, especially if programmes of activities are continuations of previous schemes or policies previously funded by mechanisms other than carbon finance. However, we can leverage a combination of data sources (including global price indices, trade flow information, deforestation maps, degradation assessments, population dynamics, etc.) to gain some insight into the overall level and direction of market leakage that could occur due to the introduction or extension of a programme of activities.

Ecological leakage

For J-REDD+ programmes, there is a high potential for beneficial ecological leakage around a jurisdiction's border. Ecological leakage refers to unintended ecological consequences that may occur when implementing such programmes. This results from displacing or shifting environmental impacts, beyond deforestation and carbon emissions, from the jurisdiction to other ecosystems or regions. Ecological leakage can take various forms, including biodiversity gain, preventing habitat fragmentation, and preventing changes to ecosystem functions or disruptions to ecological processes. Conversely, it could lead to ecological degradation, biodiversity loss, or adverse impacts on local communities that depend on those ecosystems for their livelihoods. We undertake a full assessment of ecosystems within and surrounding the area covered by the programme of activities to assess the potential for ecological leakage.

Permanence

'The risk that the carbon avoided or removed by the programme will not remain so through the time committed, either through intentional or unintentional reversals.'

Our analysis of this risk factor considers the permanence of climate benefit as it relates specifically to the contractual commitment of a given project and its credits. We distinguish the contractual commitment embodied in a carbon credit from the durability of carbon avoided or removed over 100 to 1,000 years or longer; the latter concept as applied in the carbon market is beset by inconsistencies and contradictions. To avoid confusion between contractual reality and theoretical debate, our assessment focuses on how long is actually committed to ensuring the carbon avoided or removed remains so, the mechanisms in place to guard against losses, and the strength and accuracy of the claims made.

Our assessment addresses four questions:

- How likely is it that the project's claimed carbon benefit will reverse before the end of its commitment period?
- What is the severity of any carbon stock losses, and how does this compare to the project's credit issuance?
- How likely is it that carbon losses are transient - that is, recovered through future project activity such as regrowth or replanting?
- Is the project properly mitigating this risk through a risk buffer and/or other mechanisms, so as to limit the risk to its issued credits?

Identifying the commitment period

All identified risks to permanence are then considered in relation to the identified commitment period. Because we assess reversal risk over the period actually committed, the first step in any permanence analysis is to identify that period. Commitment periods are labelled differently by different standards bodies - as commitment period, project longevity, or minimum project term, among others. In some cases, the commitment period coincides with the crediting period. In some cases, the commitment period is implicitly specified in the choice of 100 year global warming potentials for short-lived greenhouse gas species.

Assessing risk within the committed period allows for comparability between credits on the basis of what has actually been promised.

For each permanence risk driver, we estimate the likelihood that a reversal occurs before the end of the commitment period, and the proportion of the project area, carbon stock, and/or carbon benefit expected to be affected. Together these give an expected reversal, which we then translate into an impact on the project's carbon stocks per hectare and compare against the project's issuance. We then consider the effect of the risk buffer and of any other mitigation, such as replanting or committed future deductions, to arrive at a residual, unmitigated risk to the carbon stocks over the commitment period.

Framing the assessment as an expectation rather than a binary outcome matters, because the same expected reversal can be constructed in different ways: a high likelihood of a small reversal and a low likelihood of a total reversal may imply comparable expected losses, and both are captured. Individual risk drivers are assessed on this common basis, which allows risks of very different character - fire, drought, pests, encroachment, loss of rights - to be compared and aggregated coherently.

Table 4 sets out the risk drivers within our assessment of carbon accounting.

Table 4. Sub-components of our Carbon Accounting assessment.

Risk factor	Risk driver category	Risk driver
Permanence	Natural risks	Fire
		Extreme weather
		Pests and diseases
		Sea level change
	Anthropogenic risks	Programme management and carbon rights
		Encroachment risk
	Risk mitigation instruments	Stakeholder engagement
		Risk buffer and mitigation

Natural Risk

Fire

Fires can threaten the permanence of forest carbon stocks in J-REDD+ programmes. Our assessment of fire risk considers our datasets in the context of the programme, its ecosystem(s), and the causes of fire in the jurisdiction's forested environments. For example, fires play a natural role in many dryland and grassland ecosystems and may increase carbon sequestration in soils. By contrast, fires in humid tropical forest ecosystems can result in tree mortality and long-term carbon losses. When anthropogenically driven, programmes should include these emissions in their accounting and count as emissions or losses (depending on the methodology).

Spatio-temporal analysis of fire is key to assessment for J-REDD+ programmes, as changing fire activity over time is often closely related to land use and climate, and combining these observations can help us to assess evolving fire risk over time. We compare this to the fire monitoring provided by the jurisdiction and evaluate the reporting accuracy of J-REDD+ programme activities to ensure that they have fully accounted for risk. Concurrently, we examine activities that aim to mitigate fire risk, such as fire risk reduction activities, fire monitoring, and firefighting capabilities implemented by the jurisdiction, and their actual and likely effectiveness.

In addition, many programmes include a mosaic of different ecosystems, and fire activity in fire-adapted ecosystems may not increase risk. Therefore, fire activity on the larger landscape does not necessarily reflect high risk to the programme. However, if fire activity within the region is closely related to climate extremes or increases over time, the risk of fire-driven forest degradation may increase.

Extreme weather risk

Extreme weather can drive reversal risk beyond the immediate impact of flooding or a storm on the forest. For example, we may examine the likelihood of population or agricultural migration if traditional lands are persistently subject to extreme weather events and the reversals that this may drive. Therefore, we examine extreme weather metrics in a wider regional context (such as ecosystem types, topography, hydrological regimes, regional land uses, predominant species, and oceanic circulations

like El Niño). We also assess mitigating activities of the jurisdiction against extreme weather events and whether the activities undertaken by a programme are consistent and appropriate for the future drought risks present for the jurisdiction. In this light, we evaluate how extreme weather risk may change under future climate conditions by examining regional and national climate predictions. We then perform a future drought analysis for the period present-2100, based on CMIP6 climate models for three future scenarios: SSP1-2.6, SSP2-4.5, and SSP3-7.0. Analysis results include future projections of the Standard Precipitation Evapotranspiration Index drought index up to 2100, and derived future return periods of drought extremes.

Where cyclone tracks are recorded within the project's vicinity, we detail the events identified and the damage level implied by their intensity. Where tracks intersect the project area within the rated vintage period, we cross-reference our forest loss observations to establish whether loss resulted and whether it has been sufficiently accounted for. Forward-looking risk is assessed by reference to the probability of damaging events occurring near the project under the most likely climate scenario over the commitment period.

Pests and disease

Pests and diseases represent another source of permanence risk to carbon credits from J-REDD+ programmes, as they cause disturbance and mortality in forests, lowering the overall carbon stock and resulting in a reversal event. Pests and disease in agricultural lands may also spur cropland expansion into forests to maintain production levels or, if sufficiently climatically different, resist the pest or disease risk.

We examine historical pests and diseases within the jurisdiction and consider their impacts on different ecosystems. In addition, we assess whether climate change will likely change the distribution or type of pests and diseases affecting a jurisdiction's carbon stocks. Critical to this is whether they are likely to be resilient, or if pests and diseases may be detrimental to the jurisdiction or country. We assess proposed or implemented mitigatory activities, where appropriate, to manage and reduce the risk. Examples include generating resistant cultivars of certain crops or building climate change-resilient infrastructure. Finally, we consider whether the J-REDD+ programme of activities has adequately accounted for pest and disease risk as part of its risk buffer assessment.

Sea level change

J-REDD+ programmes may contain a diversity of ecosystems, including coastal or mangrove forests, that may be vulnerable to sea level change, which can drive tree mortality through flooding, saltwater intrusion, and increased risk from storm surges. Similarly, low-lying jurisdictions may face the risk of incursion during the permanence commitment they have made as part of their methodology. To interrogate this risk, we predict the extent of sea level rise within the jurisdiction's commitment period relative to a baseline from 1995 to 2014, using data from NASA and the IPCC 6th Assessment Report. Our analysis includes two scenarios, a 2 °C and 3 °C increase in global mean surface temperatures towards the end of the century to predict sea level change and associated uncertainty based on an ensemble of global climate models. We then place these predictions within the local context (such as topography, hydrological regimes, tree species, land use, sediment transport, and tectonic and isostatic uplift in relevant areas). We explore the risk mitigation instruments deployed by the jurisdiction that could prevent direct or indirect forest losses and emissions.

Geological hazards

For some jurisdictions, geological hazards such as earthquakes and volcanoes can be a significant risk for the permanence of avoided or removed emissions. Where relevant, we examine the history and impact of such events on the forest landscape. In particular, we focus on both the direct and indirect impact of losses and their incorporation into carbon accounting and risk mitigation instruments.

An example of the direct impact of a geological hazard on permanence is that if a jurisdiction claims removals from an area of forest that is subsequently destroyed by volcanic activity within the commitment period. In these instances, claimed removal emissions have been reversed, and programmes should appropriately account for this in buffer pool withdrawals. Indirect effects of geological hazards include the increased extractive behaviour of stakeholders following a natural disaster. For example, after an earthquake affecting a major population centre, a jurisdiction's forests may come under increased pressure to produce timber in response to efforts to rebuild homes and infrastructure.

Other natural risks

Beyond the core natural risks described, other natural risks can compromise the permanence of a J-REDD+ programme's emissions avoidance or removals. For example, an increased frequency of acid rain may alter tree survivability, while environmental pollution from nearby industrial activities could accelerate tree mortality. When relevant at the jurisdiction scale, we will investigate the potential impact of other natural risks on programme permanence, considering the magnitude of a reversal event or an increase in reporting-period emissions relative to the baseline that could be caused.

Anthropogenic risk

Programme management and carbon rights

Since J-REDD+ programmes are typically implemented by a jurisdictional government entity, the stability and effectiveness of government institutions will determine whether any of the J-REDD+ programme activities are at risk of reversal.

Land ownership and resource rights (such as petroleum, mining, timber, and carbon) are important factors for Avoided Deforestation activities, as a lack of clear and defensible ownership creates risks to the permanence of programme-level credits. For J-REDD+ programmes, we assume the relevant jurisdictional government has sovereign authority to implement programmes or specific activities across all included forest land within the jurisdiction. We look for a clear and legal framework for the hierarchy of rights for all stakeholders within the jurisdiction, and the permanence risk impact that uncertainties may drive.

Similarly, jurisdictional programmes cover many different land ownership types. Where land or natural resource rights overlap, the permanence of the J-REDD+ programme may be at risk. At the jurisdictional scale, we assess whether conflicts exist between private, communal, indigenous, and other land or resource rights and the J-REDD+ programme.

The level of legal assurance given for the continuation of the programme of activities is also relevant to the permanence of jurisdictional programmes. For example, we assess the extent of cross-party support for the programme's implementation and examine the likelihood that J-REDD+ ambitions could be tempered or removed during the subsequent election cycles. We also look at the level of

international agreements or commitments in place to maintain the programme over the commitment period.

Encroachment risk

In J-REDD+, this is forest encroachment and subsequent deforestation (but not driven by natural factors). Examples include expanding the jurisdiction's forestry, mining, petroleum, or natural gas extraction concessions. The number, type, and outlook for concession areas inform our view on the level of risk. We temper our view on risk if there is evidence of concession area reductions or low conflict likelihood, or if, as part of its activities, the jurisdiction successfully and equitably curtails the extent of extractive activities within its concessions.

We also consider the risk of armed conflict and other social instability or tension situations, which are subject to international humanitarian law and national legislation. In areas with a high risk of conflict, there are both immediate (i.e., losses resulting from the conflict) and longer-term (i.e., outcomes that result in substantial policy change) emissions from the jurisdiction that could result in reversals or baseline emissions being exceeded.

Demographic and development changes are important. If the jurisdiction is experiencing or incentivising population growth, historical emissions levels or the level of reversal risk estimated from non-permanence risk assessment tools may not be sufficient to account for increased demand for farmland or other infrastructure. Similarly, if large-scale infrastructure developments, such as road network improvement or expansion, are planned within or near the jurisdiction, we assess the possibility that these will result in encroachment.

Risk mitigation activities

Stakeholder engagement

The proposing sovereign must address different groups' diverse, potentially conflicting, and substantial competing interests to ensure an equitable, low-deforestation future. Stakeholder engagement is key to the success of all types of Avoided Deforestation, as their activities often depend upon community cooperation and shared goals. Jurisdictional activities usually include local community participation to reduce forest pressures by providing alternative activities or incentivising compliance.

A lack of free, prior, and informed consent or insufficient stakeholder engagement (discussed in the **Beyond Carbon** assessment) can manifest as an external risk that can cause reversals. Reversals may result from minimal stakeholder consultations, an absence of grievance channels, or a lack of benefit-sharing mechanisms, each of which may lead to non-compliance or stakeholder dissent. If there is sufficient dissatisfaction with the programme, any stakeholder group could act against the programme's aims and continue with business-as-usual activities. Programmes can counter risk through strong evidence of community support and integration with jurisdictional activities and decision-making processes.

Risk buffer and mitigation

Our assessment of permanence risk evaluates whether J-REDD+ programmes sufficiently mitigate permanence risks through specific mitigation activities, buffer pool contributions, or other

mechanisms. The magnitude and design of the buffer pool contribution are essential for understanding the carbon efficacy risk of a programme.

Jurisdictional REDD+ methodologies may not monitor individual reversal events. Instead, reversals occur when programme emissions exceed the baseline, resulting in a net atmospheric emission that year. Conceptually, this framing is not significantly different from a reversal in traditional Avoided Deforestation projects, where performance above the historic baseline does not generate credits, and projects must withdraw from the global buffer pool.

Different J-REDD+ standards use various approaches to assessing permanence risk, and there is a lack of standardised terminology around how programmes conduct Monitoring, Reporting, and Verification (MRV) to ensure permanence. J-REDD+ standards like ART TREES and Verra JNR have established procedures for assessing buffer pool contributions. These may vary: for example, TREES requires a minimum contribution of 25%, and programmes can reduce the contribution level through specific risk-reduction actions. Verra JNR has rules that determine buffer pool contributions using a non-permanence risk tool calculation over a 100-year time horizon. Standards bodies (and their registries) also differ in how they implement buffer pool mechanisms. Not only do the calculated buffer pool sizes differ, but registries also diverge in managing contributions once the commitment period ends.

We assess whether the J-REDD+ programme's buffer pool contribution is appropriate for the level of reversal risk during the commitment period. Alternatively, when there is no commitment period, we assess whether programmes will likely exceed baseline emissions beyond their current contribution level. We also examine the procedures for monitoring and determining when reversals have occurred.

Beyond Carbon safeguards assessment

BeZero Carbon recognises that carbon projects and programmes may have impacts beyond greenhouse gas avoidance and/or removal. Beyond Carbon refers to the socioeconomic and environmental aspects of carbon credit projects and programmes that are distinct from carbon efficacy.

BeZero Carbon's Beyond Carbon Safeguards Commentary provides a descriptive, qualitative discussion of potential adverse socioeconomic and environmental impacts and the safeguards intended to address them. For Jurisdictional REDD+ (J-REDD+) programmes, this includes potential impacts on communities and ecosystems within and near the programme area.

The commentary is separate and complementary to the BeZero Carbon Rating. It is not assigned a score, tier, ranking or weight and is not used to calculate or otherwise determine the BeZero Carbon Rating. The same underlying issue or evidence may be discussed in both analyses where it is independently relevant to Beyond Carbon safeguards and carbon efficacy. In such cases, any effect on the BeZero Carbon Rating arises from the issue's relevance to carbon efficacy and not from the conclusions of the Beyond Carbon commentary.

The commentary considers potential adverse impacts on people and the environment. Socioeconomic issues (*Land and resource rights, Benefit sharing, Stakeholder engagement, Labour and livelihoods*) correspond to the social component of ESG, while environmental issues (*Environmental safeguards*) correspond to the environmental component. Governance is not assessed as a standalone factor. Governance-related information, including laws, policies, institutional arrangements and stakeholder engagement processes, may nevertheless be considered where it affects potential socioeconomic or environmental impacts or the effectiveness of safeguards.

The commentary applies an impact perspective. It does not assess the financial or reputational risk that socioeconomic or environmental issues may pose to the programme, programme proponent, or carbon credit holder.

Programme-related risks are considered by first identifying inherent risks associated with the programme type, activities, geography, geopolitical context, climate, demographics and design. Analysts then consider safeguards or other mitigation measures intended to address those risks and the available evidence of their effectiveness. Any risks remaining after accounting for relevant safeguards are considered residual risks. The commentary highlights potential risk drivers and relevant safeguards without assigning risk levels, due to the challenges of generalising overall risk across a jurisdictional programme.

The scale and reach of J-REDD+ programmes require consideration of risks at a broader level than is typical for project-based activities, with particular attention to the implications of jurisdictional policies and institutional arrangements. This section identifies the Beyond Carbon risks and safeguards that may be relevant to J-REDD+ programmes.

Sources and limitations

The commentary draws on the programme documentation and external sources described in the analytical process, supplemented where relevant by applicable laws and policies, stakeholder information, government and civil-society publications, and scientific or technical literature. Information obtained through engagement with the programme or other stakeholders may also be considered and is evaluated alongside other available evidence.

The availability, completeness, consistency and timeliness of information on socioeconomic and environmental risks and safeguards may vary between programmes and jurisdictions. Available information may not capture the views or experiences of all affected stakeholders, particularly marginalised or remote groups. The commentary does not constitute an audit or assurance of programme performance, and the absence of identified information should not necessarily be interpreted as evidence that a risk or safeguard is absent.

International agreements, declarations and safeguard frameworks may be used as reference points for identifying relevant risks and safeguards. The commentary does not assign an alignment assessment or determine whether a programme's commitments are formally aligned with those instruments.

Land and resource rights

Land and resource rights concern ongoing access to land and resources in the programme area, as well as recognition of communities' carbon rights for any activities using community land, territory, or resources. Key considerations of land and resource rights risks include:

- the presence of Indigenous Peoples and/or local communities (IPs and LCs) in the programme area, and any particular considerations for those groups based on the context of the area;
- the presence of culturally significant lands in or near the programme area;
- the status of legal rights to land and resources established through either customary practices or statutory laws, or a combination of both. This includes land tenure insecurities and whether existing land tenure issues have been resolved;
- changes to IPs and LCs' land and/or resource access in the programme scenario;
- any voluntary or involuntary resettlement as a result of programme activities;
- a lack of recognition of communities' carbon rights.

Key considerations of safeguards to support land and resource rights include:

- the obtainment of free, prior, and informed consent (FPIC)[1] where Indigenous Peoples and/or local communities' land, territory, and/or resources are used;
- carbon rights attestations, and whether carbon rights are acknowledged to belong to communities/stakeholders if programme activities involve their land, territory, and/or resources;
- the programme's recognition of customary land tenure and resource rights;

[1] In the case where Indigenous Peoples and/or local communities land, territory, and/or resources are used, if FPIC must be obtained following this guidance:

The concept of FPIC originates from the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), which sets forth that any activity that affects Indigenous Peoples shall be done with the free, prior, and informed consent of those impacted. As defined by FAO, the International Finance Corporation (IFC) Performance Standards, and the Integrity Council for the Voluntary Carbon Market (ICVCM), FPIC is required when any programme uses land, territory, and/or resources that are traditionally owned, occupied, or otherwise used by Indigenous Peoples and/or local communities for livelihoods or cultural purposes. Indigenous Peoples and local communities should be given the right to actively consent voluntarily, before the implementation of the programme, and with sufficient information regarding any positive/negative impacts of the programme.

- programme activities that aid in securing land tenure, such as support in the land titling process;
- baseline social assessments that help to understand the programme's context;
- provisions that enable communities to maintain access to resources.

Benefit sharing

Benefit sharing considers risks concerning the sharing of programme revenues and/or benefits resulting from sales of the carbon units produced by the project. The assessment of a programme's benefit-sharing mechanism concerns community involvement in the shaping, structuring, and final decisions of the agreed benefit-sharing mechanism, as well as evidence of the programme's benefits to communities. We consider benefit sharing applicable in any case where communities' land, territories, resources, and/or activities are involved in generating credits resulting in any part of the programme area. Key risks involving benefit sharing include:

- inequitable or otherwise insufficient sharing of project benefits with all communities and community members involved in the project;
- the delayed delivery of benefits;
- an opaque benefit-sharing structure;
- a lack of community input into benefit sharing design;
- community scepticism of those responsible for deciding how revenues are shared;
- community dissatisfaction with benefit-sharing design, mechanism, and/or delivery.

Key safeguards involving benefit sharing include:

- engagement with communities to design the benefit-sharing mechanism;
- community consent to the design of the benefit-sharing mechanism;
- the mechanism through which benefits are delivered to communities, including monetarily (e.g., revenue) or in-kind (e.g., investment of revenues to generate community benefits);
- transparency of benefit-sharing activities (e.g., is there an ongoing monitoring of how, how much, and when project benefits are delivered?);
- the provision of evidence of benefits delivered to communities and how communities realised those benefits;
- community satisfaction with the design and delivery of benefits resulting from carbon credit sales.

Stakeholder engagement

Stakeholder engagement risks involve informing affected stakeholders accurately and proactively during the project planning and operational phases, as well as integrating feedback into project design and activities. BeZero Carbon recognises that stakeholders are not a singular unit, and that various stakeholders and viewpoints may exist for a single project, particularly at the jurisdictional scale. The key risks related to stakeholder engagement are:

- a lack of information on all potential risks and benefits of the programme provided to stakeholders;
- engagement that does not encompass all relevant stakeholders;
- inaccessible engagement, particularly for marginalised groups;
- a programme design that fails to integrate stakeholder perspectives and priorities or articulate the rationale for doing so;
- the lack of a mechanism to submit and resolve grievances;

- insufficient ongoing engagement that fails to keep stakeholders informed during the programme lifetime;
- a lack of cultural sensitivity or contextual understanding, particularly in locally accepted forms of agreement or decision-making;
- inadequate monitoring of stakeholder engagement and grievances.

Risks can be mitigated through the following safeguards:

- mapping out all potentially affected stakeholders;
- the design of preliminary stakeholder engagement sessions;
- outreach and inclusion of stakeholder engagement to all affected parties;
- accessible stakeholder engagement, i.e. the provision of materials in local languages, accessible to those who cannot read, in public and local spaces, and whether it is available for those without internet access;
- obtainment of FPIC where applicable (see Land and resource rights section);
- the programme's inclusion, accessibility, functionality, and monitoring of a grievance mechanism, and whether grievances are escalated to third parties;
- the programme's provision of ongoing opportunities for stakeholders to provide feedback about the programme activity.

Labour and livelihoods

Programme activities may impact communities' employment opportunities, sources of income/subsistence, and opportunities for skills development and economic advancement, with the potential for disproportionate effects on marginalised or vulnerable groups. As such, labour and livelihoods risks include:

- economic displacement, such as job loss;
- change in resource access such that community income and/or subsistence is negatively impacted;
- limitations of local livelihood/economic opportunities due to land/resource use restrictions;
- labour rights and/or other rights concerns, such as unsafe working conditions;
- labour discrimination or other discrimination as a result of programme activities;
- the potential for disproportionate negative impacts on marginalised communities.

Key considerations of safeguards related to labour and livelihoods include:

- providing equal opportunity for people from the communities affected by the programme to obtain employment generated by the programme (i.e. procurement first conducted locally);
- complying with local, national, and international laws and/or best practices for labour rights, where applicable, and implementing additional labour rights conditions where the effectiveness of labour laws is limited;
- provisions to retain livelihoods from any changed resource access;
- alternative livelihoods training and development;
- regular employee safety training;
- implementation of measures against possible discrimination within the programme's scope.

Environmental safeguards

The programme's primary activity of avoided deforestation is not expected to cause significant environmental risks. However, due to the programme's large scale, activities in and associated with the

programme may pose a range of risks to ecosystems across the jurisdiction. As a result, there are a variety of environmental risks that may be relevant to a programme, including:

- ecosystem degradation;
- soil degradation;
- hydrological cycle changes;
- biodiversity loss;
- waste and/or pollution as a result of programme activities;
- exogenous activities in/near the programme area that may lead to pollution and/or other environmental harm, such as logging and mining.

Safeguards to support environmental risks include:

- monitoring for any adverse outputs, i.e. pollution and/or waste;
- monitoring for adverse impacts to biodiversity, i.e. from land cover conversion to changes to hydrological functions;
- the design and implementation of programme activities or other mitigation to address adverse impacts and/or outputs.

Appendix I: Sources as of October 2026

Geospatial data sources

Our Geospatial and Earth Observation team uses data from, but not limited to, the following:

Aboveground carbon in mangroves (Caltech / Simard et al. 2018), Aboveground carbon northern Africa (NASA / Tucker et al. 2023), Administrative districts (OpenStreetMap), Amazon indigenous territories (RAISG), American Indian, Alaska Native, and Native Hawaiian Areas (U.S. Census Bureau), BeZero Carbon Boundaries Database (curated in-house from registry data and other public sources), BeZero Carbon Plots Database (curated in-house from private collections, national inventories, international plot networks, academic studies, research partnerships, and other sources), Brazil indigenous lands (Terrabrasilis), Brazil mining concessions (Brazil National Departament of Mineral Production), Brazil protected areas (National Registry of Conservation Units - CNUC), Brazilian Cadastro Ambiental Rural (Brazilian government), Brazilian Sistema de Gestão Fundiária (Brazilian government), California timber harvesting plans (California Department of Forestry & Fire Protection), Cambodia mining concessions (Open Development Cambodia), Cameroon community forest (Ministère des Forêts et de la Faune), Cameroon Forest Management Units (Global Forest Watch), Cameroon mining permits (Cameroon Ministry of Mines and Technological Development), Cameroon production forests (Ministère des Forêts et de la Faune), Canada mining permits (various open sources), Chloris Above-ground biomass stock (Chloris Geospatial), Colombia agricultural frontier (El Sistema de Información para la Planificación Rural Agropecuaria (SIPRA)), Colombia mining titles (Tierra Minada), Colombia national parks (Parques Nacionales Naturales de Colombia), Congo peat maps (University of Leeds), Consejo Comunitario Titulado (Datos Abiertos Agencia Nacional de Tierras Colombia), CORINE landcover (Copernicus), Cost maps for ARR (Busch et al. 2024), Crop Sequence Boundaries (USDA), Cropland extent and change (GLAD/UMD), Decadal Land Use and Land Cover Classifications across India (Roy et al. 2016), Democratic Republic of the Congo mining permits (DRC Cadastre Minier), Dynamic World (Brown et al (2022)), EBA Brazil aboveground carbon (INPE), Ecoregion map (Resolve), Ejido territories (Registro Agrario Nacional - Catastro Rural), ERA5 Land climate variables (ECMWF), ESA Biomass Climate Change Initiative (Santoro, M.; Cartus, O. (2026)), ESRI Sentinel-2 10m land use land change time-series (ESRI), EU Farm Structure Survey (European Commission), European Union Tropical Moist Forests (IFORCE), Florida conservation lands (FLMA) (Florida Natural Areas Inventory), Forest Extent and Height Change, 2000-2020 (GLAD/UMD), Forest/Non-Forest (JAXA), Forest Type Groups of the United States (USDA Forest Service - Forest Inventory and Analysis (FIA) Program & Geospatial Technology and Applications Center (GTAC)), Forest ownership in the conterminous United States circa 2022 (Harris et al. (2025)), Forest Planning Open Data (Hokkaido Forest Planning Division, Forestry Bureau), Forisk North American Mill Capacity Database (Forisk), Gabon mining permits (Gabon Ministry of Mines, Petroleum, and Hydrocarbons & WRI), GEDI L2B canopy cover (NASA/UMD), GEDI L4A Footprint aboveground carbon (NASA/UMD), GEDI L4B Gridded aboveground carbon (NASA/UMD), GEDI Level-2A vegetation height (NASA/UMD), Global Canopy Height (ETH Zürich), Global Distribution of Mangroves (UNEP-WCMC), Global Forest Change (GLAD/UMD), Global Human Settlement Layer (GHS-SMOD) (Schiavina M., Melchiorri M., Pesaresi M. (2023)), Global Mangrove Watch (JAXA), Global mining extent polygons (Maus et al. 2022), Global mining extent polygons (Tang & Werner 2023), Global naturally regenerating forests (UN FAO), Global peatlands (CIFOR, Wetlands International, Indonesian Ministry of Agriculture, Indonesian Ministry of Transmigration and Land Resources), Global planted forest (UN FAO), GlobBiomass above and below ground carbon (ESA), HURDAT2 hurricanes (NOAA), IBTrACS hurricanes (NOAA), Integrated Deforestation Alerts (Global Nature Watch), IPCC AR6 Sea level rise (NASA/IPCC), IUCN Red List of Threatened Species (IBAT), Key Biodiversity Areas (IBAT), Köppen-Geiger climate classification (Beck et al. (2023)), Landsat 5, 7, 8 and 9 L2 Surface Reflectance (NASA/USGS), Land cover (JAXA), Malaysia logging concessions (Global Forest Watch), MapBiomas Brazil land cover (MapBiomas Brazil), MapBiomas Colombia land cover (MapBiomas Colombia), MapBiomas Paraguay land cover (MapBiomas Paraguay), MapBiomas Peru land cover (MapBiomas Peru), Mapbox visual basemap (Mapbox), Maxar Imagery Surface Reflectance (Maxar

Technologies), MCD12Q1 Land Cover Type (NASA), MCD64A1 Burned area (NASA/UMD), Mexico mining concessions (Secretaria de Economia), Mineral Resources Data System (USGS), Minnesota DNR Management Units (Minnesota Department of Natural Resources), MOD44B Vegetation Continuous Fields (NASA), MYD10A2 Snow cover (NASA), MYD13Q1 Vegetation Indices (NASA), National Cropland Data Layer (USDA), National Flood Hazard Layer (FEMA), Navigable water (OpenStreetMap), New York Protected Area Database (NYPAD) (New York Natural Heritage Program), New York state (DEC) lands (New York State Department of Environmental Conservation), NEX-GDDP-CMIP6 (NASA/NCCS), Northern Forest land ownership map (Northern Forest Center), Oil and gas concessions (various government sources), Peru cadastral and concessions (Digital Government Secretariat Peru), Peru mining concessions (Ingemmet), Peru native community boundaries (Peru Ministry of Culture), Planet Forest Carbon Diligence (Planet Labs), Planet Quarterly visual basemaps (Planet Labs), PlanetScope Imagery Surface Reflectance (Planet Labs), Population density (WorldPop), Primary designated management objectives of forest (UN FAO), Primary humid tropical forests (GLAD/UMD), PRODES Amazon deforestation (INPE), Regrid US land parcel data (Regrid), Republic of the Congo mining permits (Republic of the Congo Ministry of Mines and Geology), Roads (OpenStreetMap), Root-shoot ratios (Huang et al. 2021), SDPT plantations, planting year and planted species (WRI / Du et al. 2022), Sentinel-2 L2A Surface Reflectance (ESA Copernicus), SkySat Imagery Surface Reflectance (Planet Labs), Soil cation exchange capacity (ISRIC), Soil nitrogen (ISRIC), Soil organic carbon (ISRIC), Soil type classification (ISRIC), Soil water pH (ISRIC), Species Rarity-weighted Richness (IBAT), SRTM Digital Elevation Model (NASA), STAR Species Threat Abatement and Restoration Metric (IBAT), STORM Cyclone historical baseline (Bloemendaal et al. (2020)), STORM Cyclone future projections (Bloemendaal et al. (2022)), US Forest Type Groups of the United States (U.S. Department of Agriculture - Forest Inventory and Analysis (FIA) Program & Remote Sensing Applications Center (RSAC)), US National Conservation Easement Database (U.S. Endowment for Forestry and Communities), US Native lands (U.S Department of the Interior Bureau of Land Management), US Protected Areas Database (United States Geological Service (USGS)), US stand age (2005) (United States Geological Service (USGS)), US state boundaries (United States Census Bureau), USA Census of Agriculture (USDA), VARDA Global FieldID (VARDA), VNP14IMGML Active fire detections (NASA/UMD), World Database on Protected Areas (IBAT), Worldclim climatology (SEI), Global Population Data (unconstrained 100m) (WorldPop).

Other third-party datasets

In addition to our geospatial sources, we also incorporate many other third-party or industry datasets and sources into our assessments of individual risk factors. These include but are not limited to:

National and regional government information on climate change, GHG emissions, forestry and food production, domestic and international trade, pricing and distribution statistics; national forestry inventories, protected areas and easements; national and regional natural risk maps; policy trackers for impact, legislation, governance and action; land registration and titling databases including regional cadasters, mining concessions and indigenous territories; NDC registry; carbon credit pricing databases; national and regional mill capacity databases.

Literature sources

Our curated database of literature sources spans all types of peer-reviewed literature and industry research, with hundreds of entries for every sector, region or risk factor.

Appendix II: Additional reading

Check out the ratings resources page on our website to find links to all of our published methodologies, in addition to our series of risk factor assessment frameworks, our frameworks for assessing project methodologies and country-level risks, deep dives on factors influencing the carbon efficacy of projects in various sectors, and more.

Updates and reviews

Version number	Date	Description
1.00	19/06/25	Initial release
2.0	27/10/26	Formatting updates, edits, and revisions to align with ESMA regulatory requirements

Disclaimer

The BeZero Carbon Rating of voluntary carbon credits represents BeZero Carbon's current opinion on the likelihood that carbon credits issued by a project achieve a tonne of CO_2e avoided or removed. The BeZero Carbon Rating and other information made publicly available or available through the BeZero Carbon Markets platform ("Content") is made available for information purposes only. The Content and in particular the BeZero Carbon Rating sets out BeZero Carbon's opinion on a particular carbon credit or project based on publicly available information as at the date expressed and BeZero Carbon shall have no liability to anyone in respect of the Content, opinion and BeZero Carbon Rating. The Content is made available for information purposes only and you should not construe such Content as legal, tax, financial or investment advice. The Content is a statement of opinion as at the date expressed and does not constitute a solicitation, recommendation or endorsement by BeZero Carbon or any third party to invest, buy, hold or sell a carbon credit. The Content is not a statement of fact and should not be relied upon in isolation. The Content is one of many inputs used by stakeholders to understand the overall quality of any given carbon credit. BeZero Carbon shall have no liability to you for any decisions you make in respect of the Content. If you have any questions about BeZero Carbon, the BeZero Carbon Rating, the BeZero Carbon Rating methodology, qualifying criteria, rating process, any element of Content, the BeZero Carbon Markets platform or otherwise please contact us at: commercial@bezerocarbon.com