

Effective Risk Management for Carbon Investments

2024

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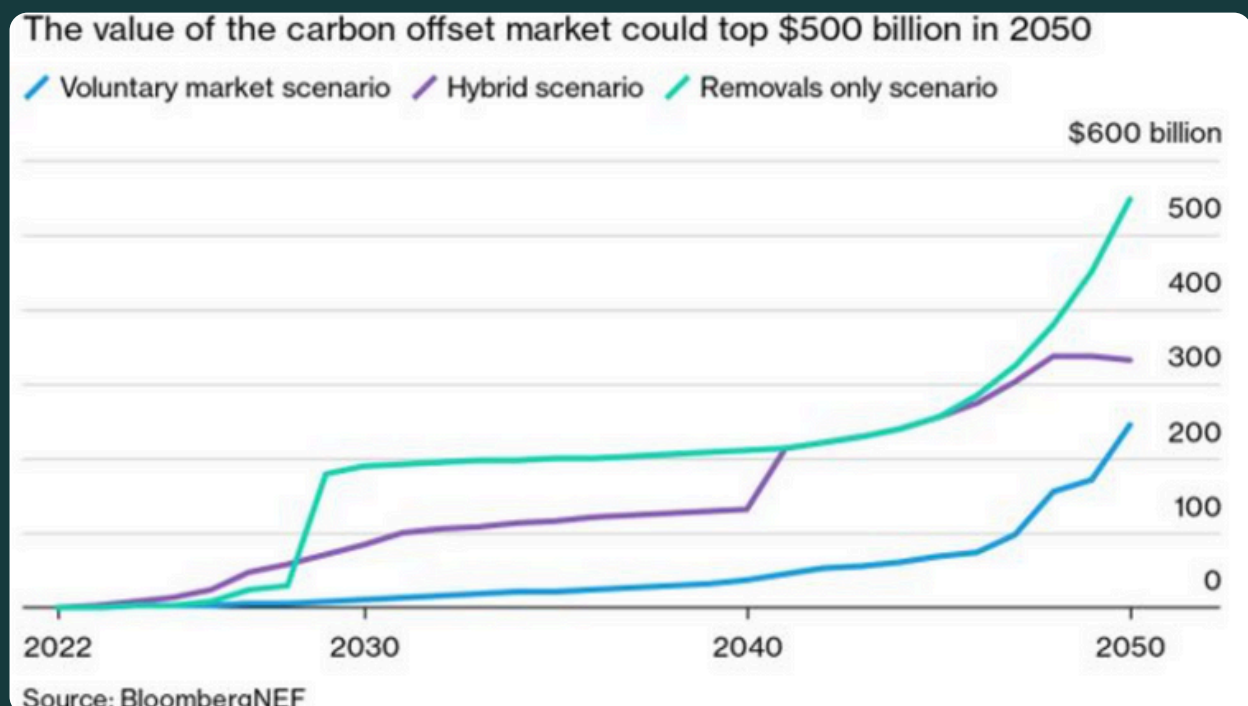
Investing in Carbon Markets

Investing in carbon markets is becoming a powerful way for investors to support climate action while gaining financial returns. By funding projects that reduce or remove greenhouse gas emissions, investors contribute directly to the fight against climate change.

Compliance markets, offer stable, regulated opportunities with instruments such as auctions and futures contracts. These markets are particularly appealing because they tend to have low correlation with conventional assets, making them a good option for portfolio diversification.

Voluntary markets, while less developed, are gaining traction as transparency and standards improve. New platforms and rating systems are emerging, enhancing their credibility. Though these markets are still relatively small and face challenges, they're expected to grow as demand for high-quality carbon credits increases. This expected rise is driven by government climate policies, corporate carbon neutrality pledges, and increasing environmental awareness.

For investors, carbon markets represent an innovative way to align financial goals with global climate objectives.



Investing in Carbon Markets

Currently, carbon credits are traded across various platforms, including exchanges and over-the-counter markets, resulting in considerable price discrepancies. High-quality credits, typically traded over the counter, making it difficult for institutional investors to participate without more stable market infrastructure.

As demand for carbon credits grows—driven by corporate net-zero pledges and global climate action—VCMs are expected to expand rapidly. The market, currently valued at around \$2 billion, could grow to \$50 billion by 2030, according to the Taskforce for Scaling the Voluntary Carbon Market. This presents both opportunities and risks for investors. While supporting projects that generate quality carbon credits offers the potential for high returns, the market's immaturity, lack of transparency, and ethical concerns around the integrity of carbon credits require investors to be cautious in their evaluations.

As the market scales, investors will need to assess not only the financial returns but also the environmental and social impacts of their investments. High-quality carbon offsets do more than offset emissions—they can bring tangible benefits to communities and ecosystems. Supporting the right projects in VCMs allows investors to align financial goals with positive climate outcomes, but success will depend on careful scrutiny of the projects' additionality and the long-term durability of their carbon reductions.

Investing in High-Quality Carbon Offset Projects

Investing in high-quality carbon offset projects is essential for effectively combating climate change. Carbon markets have faced criticism for overestimating benefits, double-counting, lack of permanence, and transparency issues. These concerns highlight the need for projects that provide genuine and measurable environmental benefits.

High-quality projects ensure real contributions to reducing greenhouse gas emissions. They also offer additional benefits, such as biodiversity preservation and community development. Supporting verified, high-quality projects bolsters corporate reputation by demonstrating a genuine commitment to sustainability.

Key Elements of High-Quality Project Based on ICVCM

Additionality

The principle that a carbon project must generate benefits, such as reduced emissions or increased removals, that would not have occurred in the absence of the project.

Co-benefits

Additional advantages of carbon projects that extend beyond greenhouse gas reductions, such as enhancing community well-being and preserving biodiversity.

Permanence

High-quality projects must ensure the long-term storage of carbon. Effective permanence strategies ensure that sequestered carbon remains stored over the long term, providing lasting environmental benefits.

Quantification

A high-quality project should have established scientific methods for accurately measuring greenhouse gas (GHG) emission reductions and removals from projects.

Additional Key Elements of High Quality Carbon Projects

Contribution toward net-zero transition: The mitigation activity must avoid locking in GHG emissions, technologies, or carbon-intensive practices that are incompatible with the goal of achieving net-zero GHG emissions by mid-century.

Robust independent third-party validation and verification: The carbon-crediting project must establish program-level requirements for independent third-party validation and verification of mitigation activities to ensure their accuracy and credibility.

Transparency: The carbon project must provide comprehensive and transparent information on all credited mitigation activities. This information should be publicly available in an electronic format and easily accessible to non-specialized audiences, allowing for proper scrutiny of the mitigation activities.

Tracking: The carbon project must operate or use a registry to uniquely identify, record, and track mitigation activities and issued carbon credits. This guarantees that the credits are securely and clearly identifiable, preventing mismanagement or misuse.

No double-counting: The GHG emission reductions or removals from the mitigation activity must not be counted more than once towards achieving mitigation targets or goals. This includes avoiding double issuance, double claiming, and double use of carbon credits.

Effective governance is essential for a carbon-crediting program to ensure transparency, accountability, continuous improvement, and the overall quality of carbon credits.

Ex-Ante, Ex-Post, and Pre-Purchase Carbon Credits

When investing in carbon credits, it's crucial to understand the different types available and their implications, as not all carbon credits are the same. Credits can be classified as ex-ante, ex-post, or pre-purchase, each carrying its own set of risks and benefits.

Here's a closer look at what these terms mean for carbon buyers:

What Are Ex-Post Carbon Credits?

Ex-post carbon credits are issued after the carbon reduction or removal has already occurred. For example, in a reforestation project, the trees have fully grown, and the carbon sequestration has been measured and verified before credits are issued. Since the carbon benefit is a proven fact, these credits offer a high level of certainty for buyers.

Benefits of Ex-Post Credits:

- **Lower Risk:** Since the project's carbon reduction has already taken place and been verified, ex-post credits provide assurance that the environmental benefits are real and measurable. This reduces uncertainty for the buyer
- **Immediate Carbon Credit Retirement:** Buyers can retire ex-post credits promptly upon purchase. Once the carbon reduction has been verified, the credits can be registered and retired in the buyer's name, confirming that the offset has been applied.

However, not all carbon projects can issue ex-post credits, particularly those still in development or early stages, which is where ex-ante credits come in.

Ex-Ante, Ex-Post, and Pre-Purchase Carbon Credits

What Are Ex-Ante Carbon Credits?

Ex-ante carbon credits are issued based on anticipated future carbon reductions or removals. In this case, the project has started but has not yet delivered the expected carbon benefits. For example, in an afforestation project, credits may be sold after seedlings are planted, but before the trees have grown enough to sequester significant amounts of CO₂. The carbon benefit will materialize in the future as the project progresses.

Benefits of Ex-Ante Credits:

- **Support for Early-Stage Projects:** Purchasing ex-ante credits provides critical funding for ongoing or new projects. Buyers help ensure that the project has the resources it needs to succeed, thus actively contributing to its development.
- **Engagement Opportunity** Buyers often receive updates on the project's progress, offering opportunities to engage stakeholders, employees, and customers by showcasing their involvement in climate action.

Risks of Ex-Ante Credits:

Because the carbon reductions have not yet been achieved, ex-ante credits come with a higher level of risk. The project could face challenges that prevent it from delivering the expected environmental benefits, meaning buyers could end up with credits that don't fully offset their emissions. Therefore, it's crucial to ensure that the project has a solid methodology and robust systems for monitoring, reporting, and verifying (MRV) carbon reductions over time.

Ex-Ante, Ex-Post, and Pre-Purchase Carbon Credits

What Are Pre-Purchase Carbon Credits?

Pre-purchase carbon credits are somewhat similar to ex-ante credits, but they are sold before the project is operational or the credits are officially issued. This is often the case with innovative carbon removal technologies, such as Direct Air Capture (DAC), where projects are still in the construction or planning phase. Buyers commit funds to the project now, with the understanding that carbon credits will be delivered in the future once the project is up and running.

Benefits of Pre-Purchase Credits:

- **Early-Stage Funding:** Pre-purchase agreements are essential for many emerging technologies, providing the upfront capital needed to make groundbreaking projects, such as DAC plants, a reality.
- **Potential for High Impact:** Pre-purchase credits offer a unique opportunity to support high-potential projects that could have a transformative impact on carbon removal. By investing early, buyers help scale innovative solutions that are critical to addressing climate change.

Risks of Pre-Purchase Credits:

Since the project has not yet begun full operations, there is inherent risk in pre-purchasing credits. The project may face delays, fail to achieve its carbon removal goals, or struggle to issue credits as promised. As with ex-ante credits, thorough due diligence is essential to mitigate these risks.

Ex-Ante, Ex-Post, and Pre-Purchase Carbon Credits

Ex-Ante vs. Ex-Post vs. Pre-Purchase: Which is Right for You?

All three types of carbon credits—ex-post, ex-ante, and pre-purchase—play a crucial role in the carbon market, but they serve different purposes and come with varying levels of risk.

Here's a summary of what each offers:

- **Ex-Post Credits:** Best for buyers seeking immediate, verified carbon reductions with minimal risk. These are ideal for organizations looking for assured offsets to apply directly to their emissions.
- **Ex-Ante Credits:** These are suited for buyers who are willing to support projects in progress and accept some risk in exchange for contributing to the project's success.
- **Pre-Purchase Credits:** Perfect for buyers who want to fund innovative, early-stage projects that could offer high-impact carbon removal in the future but are willing to wait for the credits to

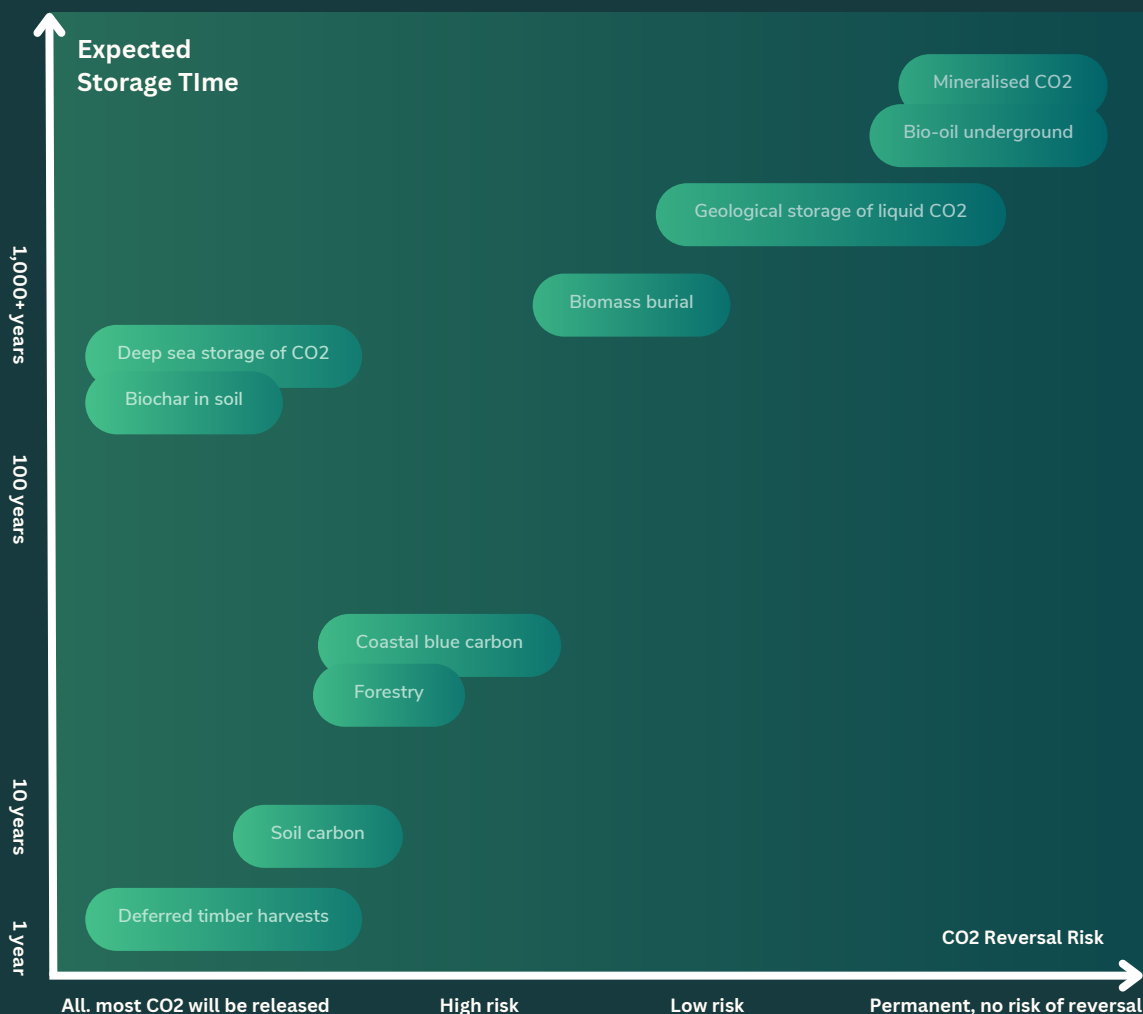
Key Risks in Carbon Investments



Understanding Permanence in Carbon Markets

In the context of carbon credits, permanence refers to how long the carbon dioxide removed or avoided by a project will remain out of the atmosphere. This concept is vital because the true impact of carbon offset projects is only meaningful if the carbon stays sequestered or avoided for a significant period, preventing its re-entry into the atmosphere and contributing to climate mitigation.

To evaluate permanence, we must shift our mindset from short-term human timelines to long-term geological ones. Carbon dioxide released today may remain in the atmosphere for hundreds of years—anywhere between 300 and 1,000 years. Therefore, the best carbon offset projects aim to ensure that the carbon they capture or avoid stays out of the atmosphere for at least 100 years. While not an eternity, this 100-year benchmark is a practical target used by many projects to label themselves as “permanent.”



Source Tabitha Whiting, What is permanence in carbon offsetting? And why is it important?

The Challenge of Ensuring Carbon Permanence

Ensuring permanence in carbon offsetting is one of the most complex challenges. Predicting future events, such as natural disasters, climate changes, or human intervention, is difficult, making it challenging to guarantee that carbon remains sequestered for long periods.

Different types of carbon offset projects face varying levels of reversal risk, for example:

- Renewable energy projects like solar or wind farms have a lower reversal risk since, even if destroyed, they do not re-release stored carbon; they simply stop generating future benefits.
- Sequestration projects, including forests, soil management, and certain technological solutions, face higher risks. Any physical disruption, such as wildfires, deforestation, or equipment failure, could lead to the stored carbon being released, negating both past benefits and future potential.

Some reversals can be avoided through careful project management—such as preventing over-harvesting or ensuring land use remains consistent—while others, like natural disasters, are beyond human control.

For instance, a forestry project located in a drought-prone region is at higher risk of wildfires, which could release large amounts of stored carbon back into the atmosphere. Similarly, logging, pests, and diseases pose significant threats to nature-based carbon storage projects.

Risk Mitigation Strategies

Effectively managing risks in carbon credit investments is key to maximizing your environmental impact while safeguarding against uncertainties. Here are several strategies you can use to ensure the best outcomes for your company's carbon offset purchases:

1. Align Your Investments with Internal Goals

To manage risk, it's essential to have a clear understanding of your company's climate goals, values, and risk tolerance. Are you more inclined towards technology-based solutions, such as carbon capture, or do you prefer nature-based solutions like reforestation? Consider what co-benefits (such as biodiversity or community support) matter most to your company. Furthermore, evaluate whether you're comfortable investing in high-risk, high-reward R&D projects, or if you need the certainty that comes with verified, high-quality, permanent credits. Aligning these factors with your investment decisions will help you mitigate internal risk.

2. Prioritize Verified or Verifiable Credits

Ensuring that the carbon credits you purchase are independently verified by a trusted third party can significantly reduce risk. Verification bodies audit projects to ensure their methodologies for measuring carbon reductions or removals are scientifically sound and robust. They also evaluate factors such as additionality, the risk of reversal, and the potential for leakage. Ongoing monitoring ensures that the credits remain valid over time, giving buyers confidence in the quality and impact of the project.

Risk Mitigation Strategies

4. Investigate the Project Developer

Researching the project developer can provide insight into the reliability of your investment. Key questions include: How long has the developer been selling carbon credits? What do their customers say about them? Are their technologies fully operational, or still in the R&D phase? How do they measure, track, and deliver carbon credits? Additionally, assess whether the project is vulnerable to regulatory changes or operational risks that could affect credit delivery. Developers with a strong track record and a diverse portfolio of projects are more likely to offer stable, dependable credits.

5. Diversify Your Portfolio

Diversification is one of the best strategies for reducing investment risk. Spread your carbon credit purchases across a range of projects, asset classes, and risk profiles. For companies with low risk tolerance, prioritize high-quality, verified credits with low reversal risk and strong durability. By balancing your portfolio with a mix of low-risk, highly durable credits and more innovative or high-impact projects, you can maximize the effectiveness of your carbon offset strategy while minimizing exposure to individual project failures.

6. Build a Buffer

To further protect your investments from the risk of non-delivery or reversals, consider purchasing more credits than you need. These surplus credits act as a buffer against any potential shortfalls in credit delivery. To reduce risk further, consider buying durable, technology-based removal credits from projects that are already operational and widely distributed. This ensures that your buffer remains reliable in the event of unforeseen reversals.

Risk Mitigation Strategies

7. Monitor Market Trends

The carbon market is constantly evolving, with new technologies emerging, regulatory frameworks changing, and scientific standards improving. Certain types of credits may gain or lose appeal depending on these developments. If your company lacks the time or resources to track these shifts, consider consulting trusted platforms, brokers, or consultants. You can also observe the purchasing strategies of other organizations with similar sustainability goals to help guide your decisions.

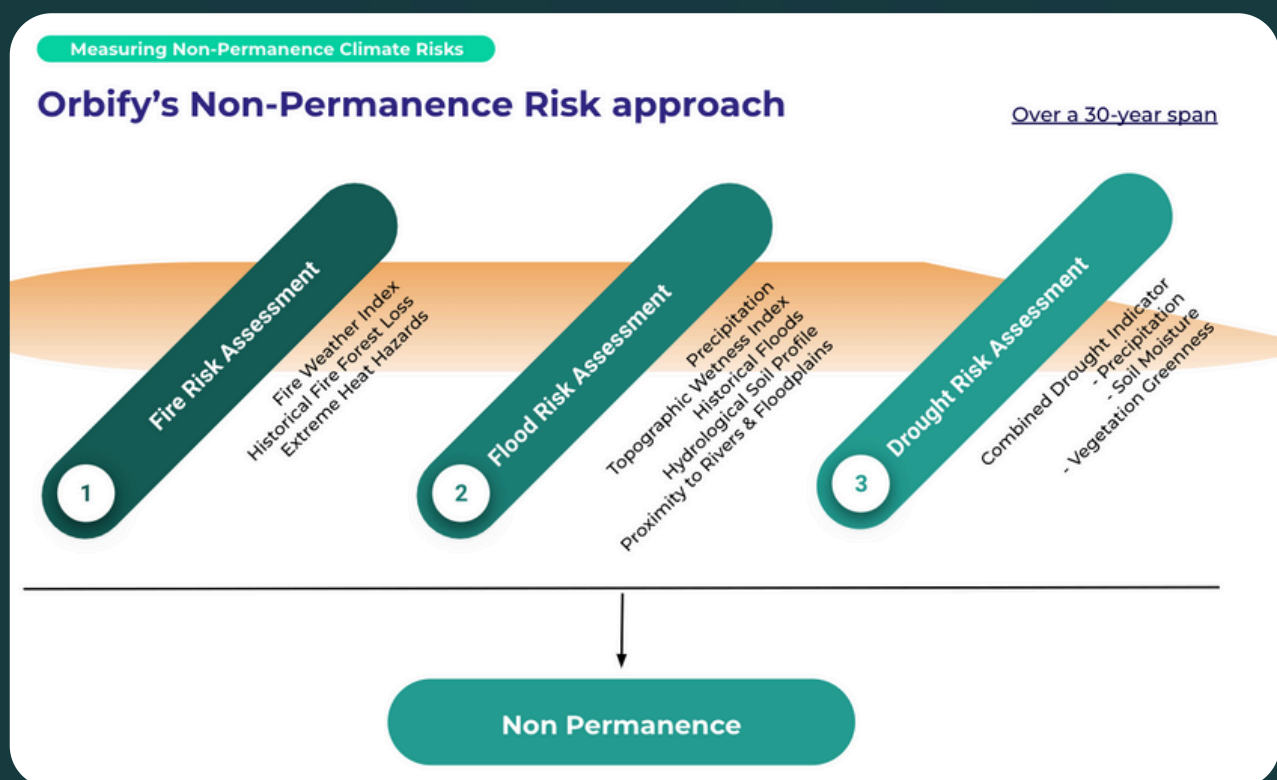
8. Ensure Contract Clarity

When purchasing carbon credits directly from developers, be clear about the terms of the contract. It should outline key details such as the quantity of credits, pricing, delivery timelines, and roles and responsibilities. The contract should also address how risks will be managed and the consequences if the project fails to meet expectations. For additional clarity, consider specifying that removal credits are priced and tracked separately from avoidance credits, to better manage the different risks.

Orbify for Effective Risk Management

Orbify's Non-Permanence Risk Tool

At Orbify, we drew inspiration from Verra's approach to addressing non-permanence risks in carbon projects. By analyzing historical data from the past 30 years, we use multicriteria analysis and existing risk models to assess the risk of non-permanence due to natural hazards. Our goal is to identify high-risk areas globally by studying how natural hazards have historically impacted project regions, providing insights to better manage and mitigate these risks.



Fire Risk Assessment

At Orbify, we assess fire risk using three main factors:

1. **The Canadian Fire Weather Index:** This tool estimates global fire danger based on current and forecasted weather conditions.

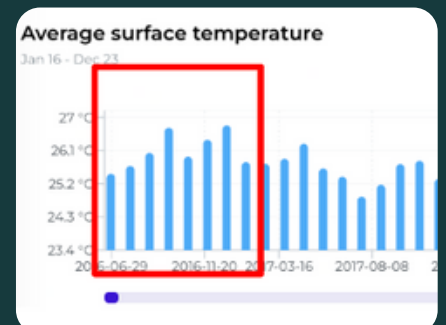
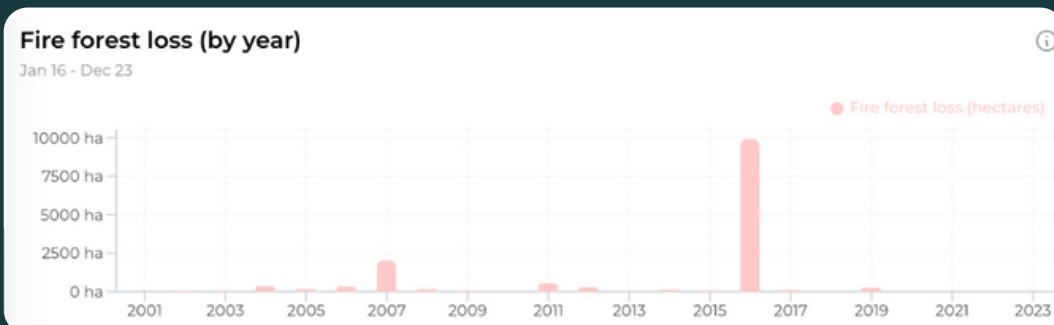
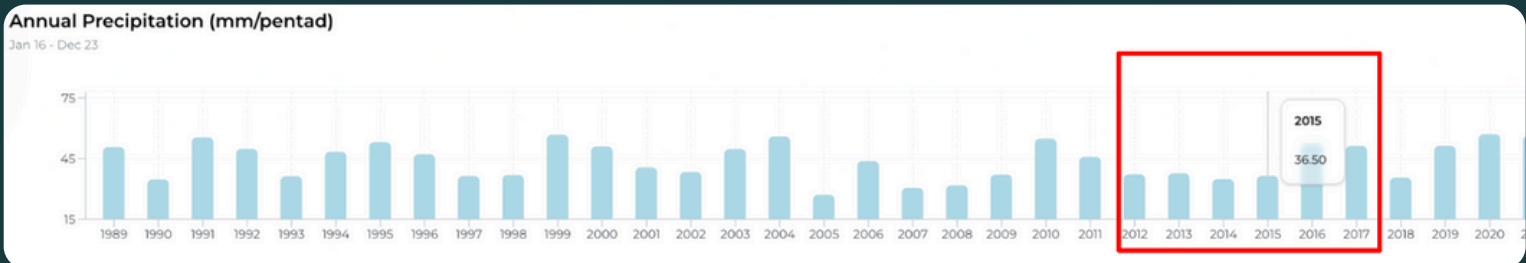
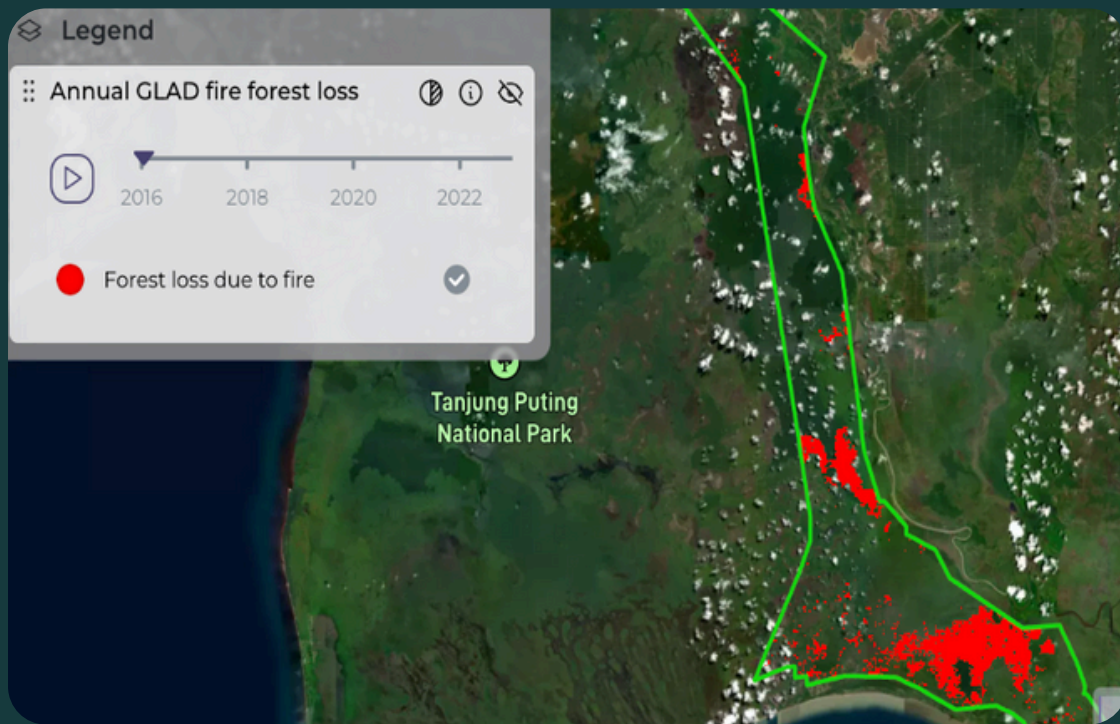
2. **Proximity to Previous Burn Areas:** We evaluate how close an area is to regions that have burned in the past, as these places often contain materials that can easily catch fire again.

3. **Extreme Heat Measurements:** Identifying areas prone to high temperatures, which increase fire risk by drying out vegetation and creating the conditions for wildfires.

Fire Risk Assessment

Case Study

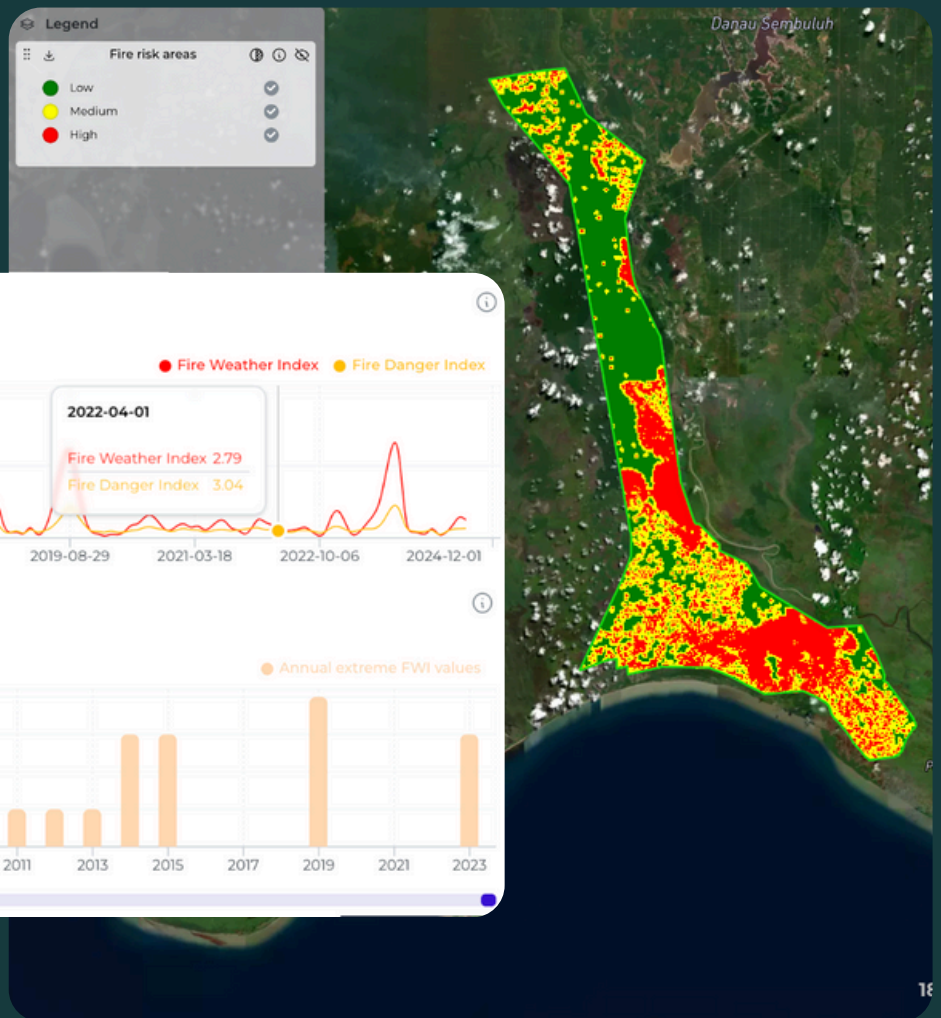
The fire risk assessment for the Rimba Raya Biodiversity Reserve highlights the significant forest loss from wildfires in 2016 and 2019, as shown on the map. Additionally the charts are representing the annual precipitation, fire-related forest loss, and surface temperature provide insights into the environmental factors driving the increased fire risk.



Fire Risk Assessment

Case Study

This analysis highlights significant wildfire impacts from 2016 to 2019. The map identifies areas at varying fire risk levels (low, medium, high), while the chart tracks Fire Danger Indices and extreme Fire Weather Index (FWI) values over time. The data reveal peaks in fire danger that align with the recorded wildfires, effectively illustrating the severity of fire hazards in specific areas of the reserve.



Flood Risk Assessment

Case Study

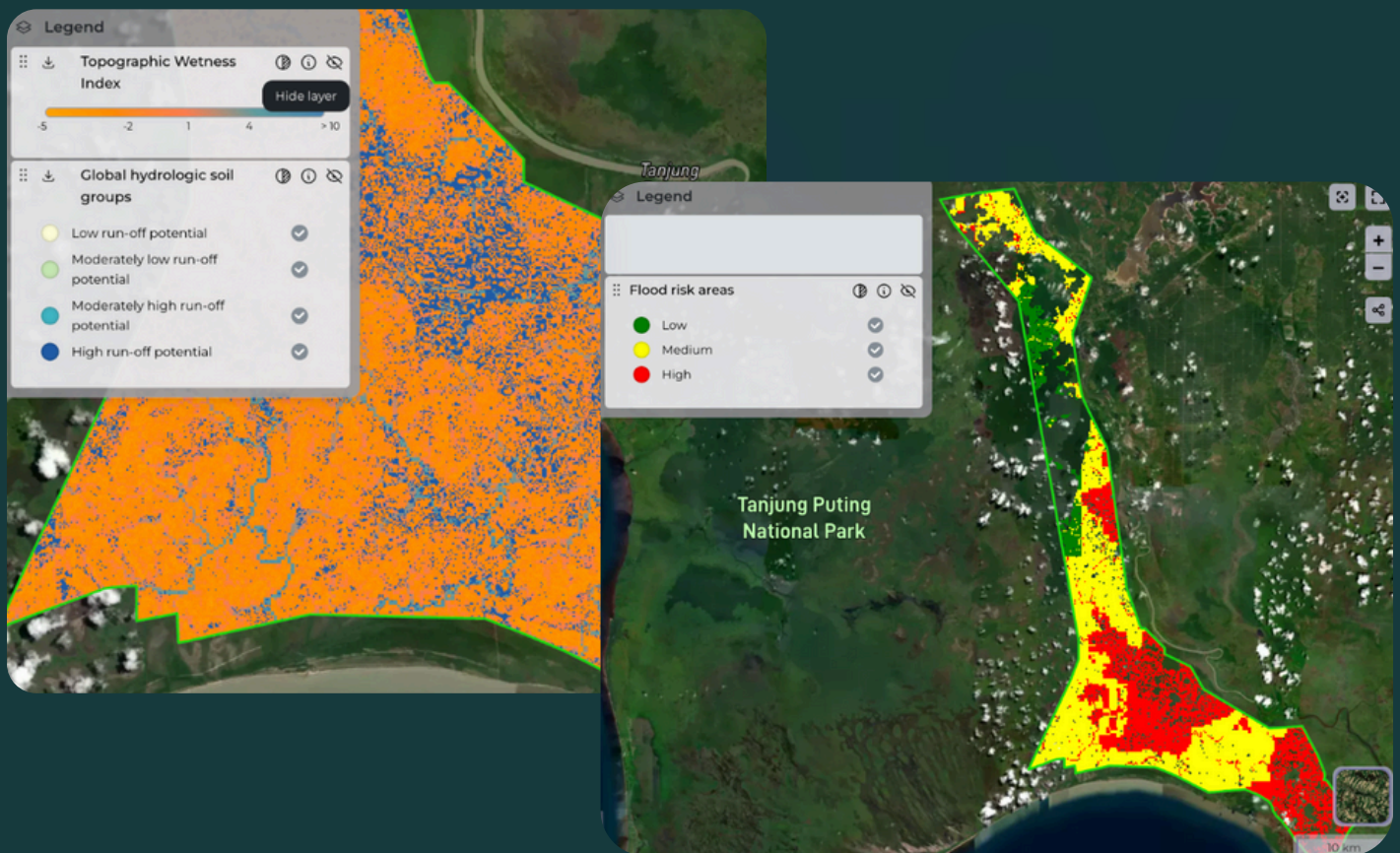
The flood risk assessment at Orbify is based on several factors:

- 1. Estimation of Climate Normal Precipitation Values:** We assess typical precipitation levels for a region and identify anomalies where exceed normal values, increasing flood risk.
- 2. Topographic Profile:** This involves analyzing local geographical features to understand how they influence both the direction and accumulation of runoff flow, helping to identify areas more prone to flooding.
- 3. Historical Flood Events:** We evaluate the number of past flood events in the region to understand recurring flood risks.
- 4. Hydrological Soil Profile:** We analyze how well the soil in the area can absorb water, as poor absorption increases the likelihood of flooding.
- 5. Proximity to Rivers and Floodplains:** The closeness to water bodies and floodplains is assessed, as these areas are at higher risk for flooding, especially during heavy rainfall events.

Flood Risk Assessment

Case Study

This section of our analysis focuses on flood risk, with the topographic wetness index and soil runoff potential maps identifying areas with high runoff potential, indicating where water may accumulate. The flood risk map categorizes regions into low, medium, and high risk, providing a clear visualization of the most vulnerable areas. An annual precipitation chart offers further context by showcasing historical precipitation patterns that contribute to the overall flood risk.



Drought Risk Assessment

Case Study

For drought risk assessment, we utilize the Combined Drought Indicator (CDI) system. This approach is based on the assumption that significant drops in rainfall lead to reduced soil moisture. The CDI evaluates data on:

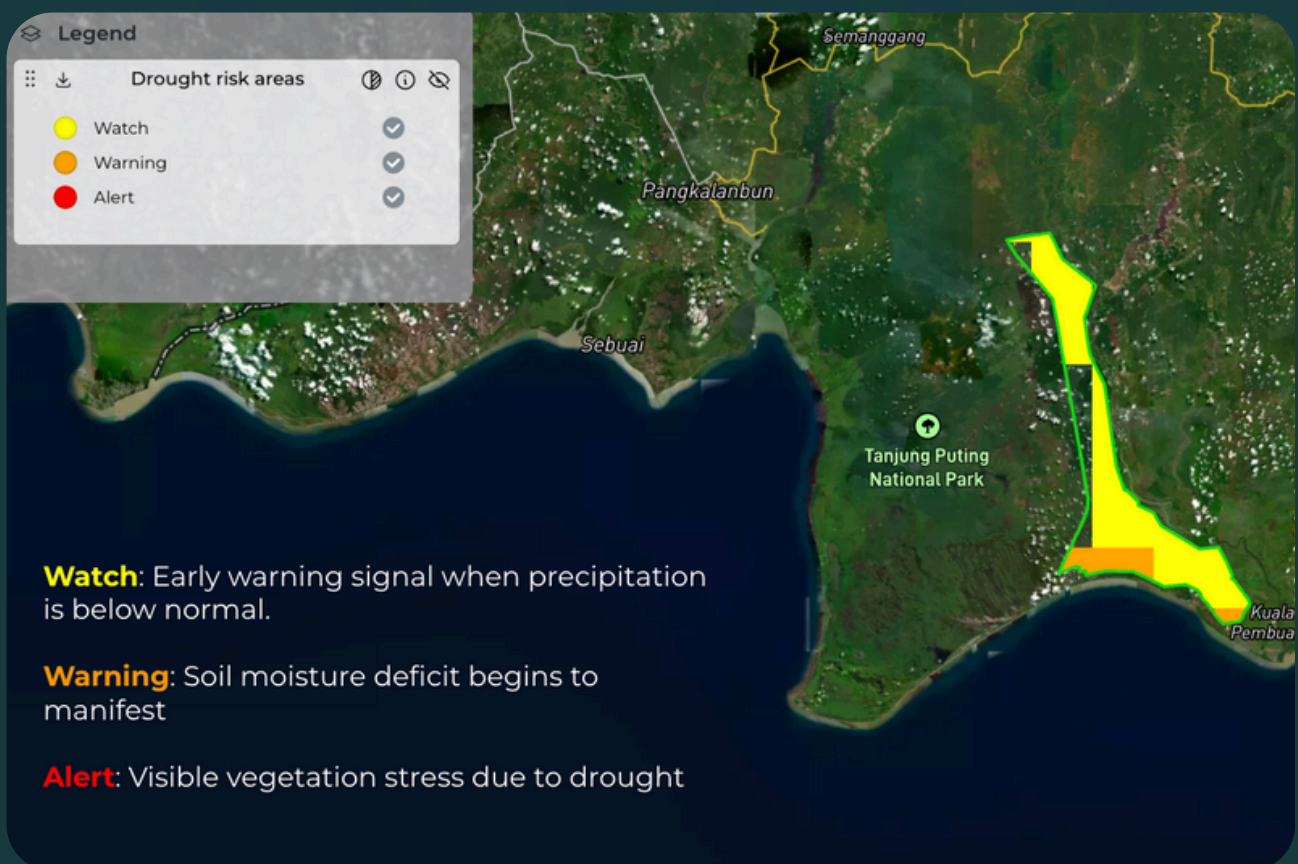
1. **Rainfall:** Identifying regions experiencing lower-than-average precipitation.
2. **Soil Moisture:** Measuring how much water is retained in the soil, which directly impacts vegetation health.
3. **Plant Light Absorption:** Analyzing how much light plants are absorbing, which indicates plant stress from water scarcity.

By combining these data points into a unified equation, the CDI identifies areas where soil is excessively

Drought Risk Assessment

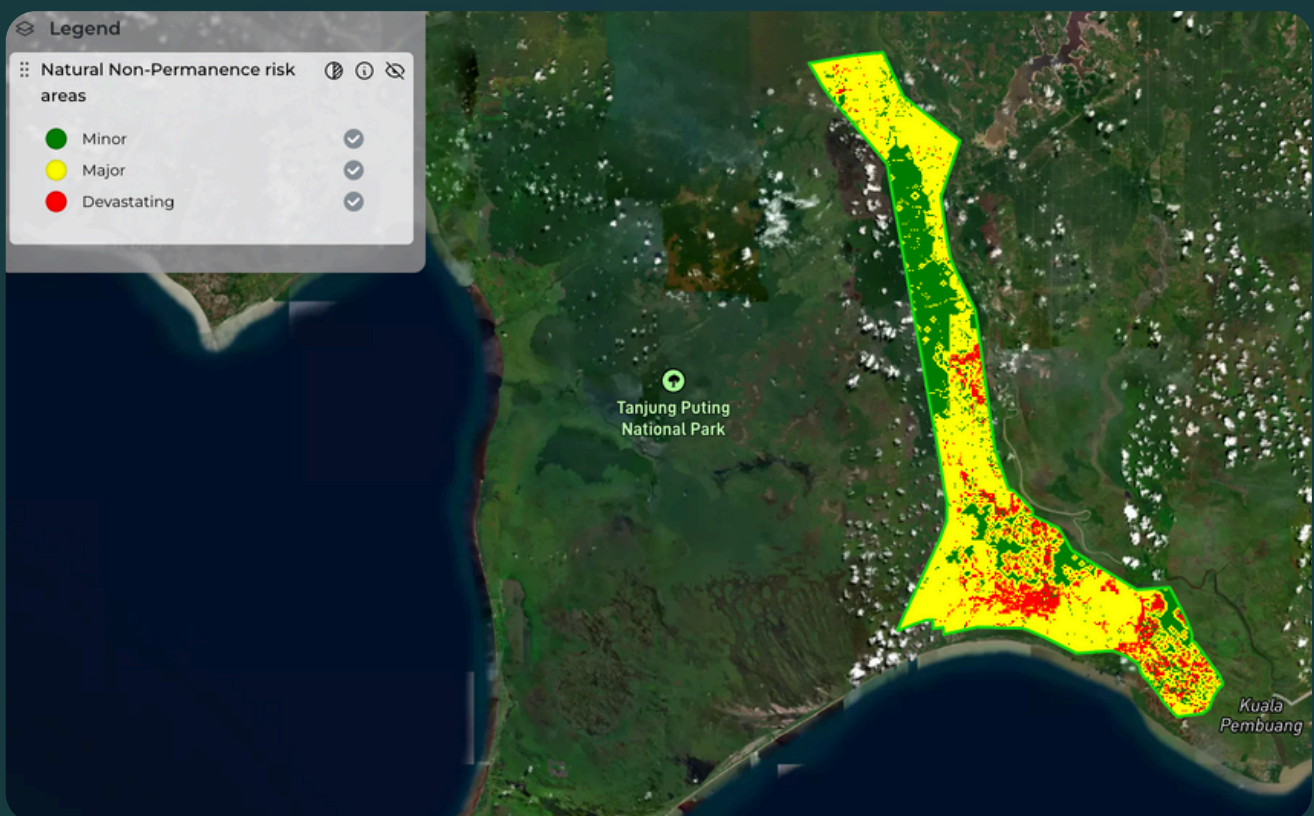
Case Study

This part of our case study provides a Drought Risk Assessment for the Rimba Raya Biodiversity Reserve Project, highlighting areas at risk of drought, categorized into Watch, Warning, and Alert levels. The Watch level signals early warnings due to below-normal precipitation, Warning indicates soil moisture deficits, and Alert reflects visible vegetation stress. This assessment supports proactive management by identifying areas that require attention to mitigate drought impacts on the project's biodiversity and carbon sequestration goals.



Overall non permanence risk analysis

As the last part of our analysis, a comprehensive summary of non-permanence risks was conducted, consolidating fire, flood, and drought assessments into a single map. This map highlights areas with minor (green), major (yellow), and devastating (red) risks, aiding in the development of targeted strategies to ensure long-term project viability and carbon goals.



Thank you!

If you're seeking for Carbon Project Risk Assessments, Orbify offers a comprehensive tool that utilizes advanced satellite data to help you assess environmental risks.

Our solution ensures investors can reduce carbon investment risks while maintaining the highest quality standards for carbon project investments.

Ready to get started? Contact our experts today to learn more!

[Schedule a call with our experts!](#)



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