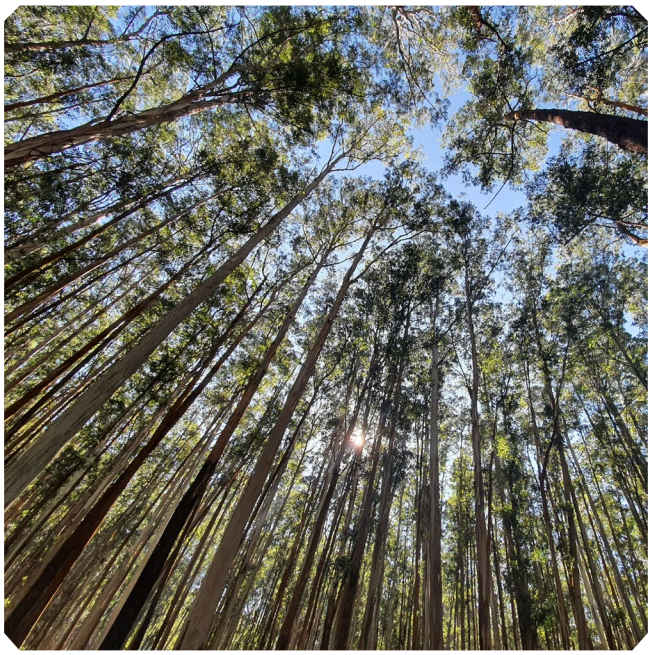
Australian Government
Clean Energy Regulator



Human-induced regeneration method

Managing project risk to deliver carbon abatement for Australia

V1.0 - 11 February 2025

Australian Carbon Credit Unit Scheme

Acknowledgement of Country

We acknowledge the Traditional Owners of Country throughout Australia and recognise their continuing connections to land, waters and culture. We pay our respects to them, and their Elders past and present.

About this report

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Contents

Key concepts, acronyms and terms

Below are definitions of some key concepts, acronyms and terms used in this document.

> **Definitions boxes** like this one are also used throughout the document where important terms appear.

Table of definitions

Term	Definition
Australian carbon credit unit (ACCU)	One ACCU represents 1 tonne of CO_2-e removed from the atmosphere or avoided (in the case of HIR projects, 1 ACCU represents 1 tonne of CO_2-e removed from the atmosphere and sequestered in the form of carbon in regenerating native vegetation). It is a carbon accounting unit used to demonstrate compliance with regulatory or voluntary emissions obligations.
Australian Carbon Credit Unit Scheme (ACCU Scheme)	The scheme supports investment in carbon abatement and is established under the *Carbon Credits (Carbon Farming Initiative) Act 2011*.
Additionality (additional abatement)	In the ACCU Scheme, additionality means carbon abatement that is unlikely to occur in the ordinary course of events. In the HIR method context this refers to HIR activities causing sequestration that would be unlikely to occur in a business-as-usual scenario.
Baseline period	The 10 years that occurred immediately before a project's commencement date.
Baseline forest	Any pre-existing forest cover in an HIR project area (baseline forest is excluded from CEAs).
Carbon abatement	The removal of greenhouse gases from the atmosphere (also known as sequestration) or the avoidance of greenhouse gas releases into the atmosphere. The HIR method provides carbon abatement through sequestration. See also Sequestration.
Carbon estimation area (CEA)	An area that has been determined as suitable for regeneration by the HIR project requirements. CEAs are the only parts in a project area that are eligible for crediting. See also *Forest potential* and *FullCAM*.
Carbon stock	The amount of carbon stored in vegetation at a point in time.
CO_2-e	Carbon dioxide equivalent. A term to describe different greenhouse gases using a common unit, based on the equivalent amount of carbon dioxide with the same global warming effect. Abatement is credited at a rate of 1 ACCU per 1 tonne CO_2-e.

Term	Definition
Crediting period	The period for which HIR projects are entitled to receive ACCUs. HIR projects have a 25-year crediting period (the same as other sequestration projects under the ACCU Scheme).
Conservativeness	At a project level, conservativeness refers to the design of the HIR method to ensure carbon abatement estimates are likely to underestimate the amount of carbon sequestration that occurs as a result of changed land management activities. At a scheme level, buffers and discounts are applied to account for temporary carbon losses or shorter project permanence periods.
Crediting pause	An element of the HIR method which can pause the issuance of ACCUs in certain circumstances, as detailed in the HIR method. This may occur when an area of land is removed from a CEA during re-stratification or as the result of a disturbance event such as a fire.
Disturbance event	An event that damages or destroys vegetation such as fire, drought, pests and diseases. Accidental or intentional introduction of suppressors can also cause disturbances (for example, allowing livestock to graze in regenerating areas or clearing vegetation). See *Suppressors*.
Forest cover	An area of at least 0.2 hectares with trees and shrubs that are 2 metres or more in height and provide crown cover across at least 20% of the land.
Forest potential	An area of at least 0.2 hectares with trees and shrubs that *have the potential* to reach at least 2 metres in height and provide crown cover across at least 20% of the land. The certainty that a given area of land has forest potential increases over time as the project is implemented and more data are collected.
Full Carbon Accounting Model (FullCAM)	A calculation tool developed by the Department of Climate Change, Energy, the Environment and Water for modelling Australia's greenhouse gas emissions from the land sector. The HIR method uses FullCAM (and its predecessor, the Reforestation Modelling Tool) to calculate carbon abatement from regenerating vegetation, and losses from disturbance events.
HIR activities	New land management activities, specified by the HIR method and carried out in project areas to mitigate existing suppressors that have prevented an area of land from developing forest cover. These activities must result in, or be reasonably expected to result in, the CEA becoming native forest through regeneration and attaining forest cover.

Term	Definition
HIR method	The *Carbon Credits (Carbon Farming Initiative) (Human-Induced Regeneration of a Permanent Even-Aged Native Forest—1.1) Methodology Determination 2013* is the HIR method legislation. All HIR projects are registered under the original legislation or one of 3 updates to the method (compilations).
National Inventory Report	An annual report that fulfils Australia's greenhouse gas inventory reporting requirements under the United Nations Framework Convention on Climate Change.
Offsets integrity standards	The offsets integrity standards are the legislated criteria that all methods under the ACCU Scheme must meet. They are based on international standards and ensure carbon credits issued under methods represent real emissions reductions that may be counted towards meeting Australia's international emissions reduction obligations.
Offsets reports	Reports required from project proponents to earn ACCUs. Offsets reports must contain a description of the HIR activity or activities that were undertaken for each CEA and provide other information as required by the CFI Act, the CFI Rule and the HIR method. Project proponents must also provide evidence that the commencement of one or more HIR activities resulted in, or could reasonably be expected to result in, the CEA becoming native forest through regeneration and attaining forest cover.
Permanence period	The period for which sequestration projects (including HIR projects) must legally protect the carbon stock that ACCUs have been issued for. Project proponents can choose either a 25-year or 100-year permanence period. The 25-year period is subject to a 20% reduction in ACCU issuance to help buffer against potential carbon losses across all projects.
Permanence plan	A plan developed by project proponents that show how they are protecting, or intend to protect, carbon stocks that ACCUs have been issued for. Plans must cover the entire project permanence period.
Project area	The location where project activities are being undertaken. Not all the land within a project area will be eligible for crediting – carbon estimation areas (CEAs) are defined within the project area to ensure that only areas that meet eligibility requirements are credited.
Project proponent	The individual or organisation that has the legal right to carry out an HIR project and has a lawful and exclusive right to the ACCUs that are generated from it. A project proponent can be the landholder, leaseholder or native title holder of an area of land, or another person they have assigned this responsibility to. There can be more than one project proponent undertaking a project.
Reporting projects	Project proponents that have submitted an offsets report of regeneration outcomes to demonstrate that their project complies with legal requirements and the HIR method requirements. This included providing evidence of regeneration outcomes for the purpose of being issues ACCUs.

Term	Definition
Re-stratification	The process of redefining the boundary of a CEA to remove areas that are no longer eligible for crediting. The initial stratification does not include any areas of existing forest cover, or any areas that do not have forest potential. During re-stratifications, areas that are no longer eligible are identified and removed. In some cases, where carbon stock is reduced but forest potential remains (for example, as a result of a disturbance event) the affected area may be reclassified as a separate CEA rather than removed completely. This allows adjustments to be made to keep projects on track, such as pausing the modelling period for the affected area. See also *Stratification*.
Sequestration	The removal of CO_2 from the atmosphere by sequestering carbon in vegetation and/or soil. *See also Carbon abatement*.
Suppressors	Factors that have suppressed the growth of native vegetation and the development of forest cover. Under the HIR method, eligible suppressors on non-conservation land are livestock, feral animals, plants not native to the area, and mechanical or chemical damage or destruction of vegetation.
Stratification	The process of defining the boundary of a CEA to only include land that meets the legal eligibility requirements of an HIR project (see Eligibility and registration), does not contain baseline forest or areas without forest potential. Credits are only issued for abatement that occurs in CEAs. See also *Re-stratification*.

Note regarding data and statistics

All data in this report is current up to May 2024, unless otherwise stated.

This paper has been developed for the purpose of communication to a broad range of stakeholders within the ACCU Scheme. Additional scientific and analytical resources are available on the Clean Energy Regulator's website.

Executive summary

Carbon sequestration plays an important role in mitigating climate change. Currently, the only way we can sequester carbon from the atmosphere at a large scale, and at reasonably low cost, is by encouraging plant growth, because, as plants grow, they naturally pull carbon from the atmosphere using energy from the sun. The Australian Carbon Credit Unit Scheme (ACCU Scheme) supports this approach, including through human -induced regeneration (HIR) projects overseen by the Clean Energy Regulator (CER). The HIR method delivers a robust framework for large-scale carbon sequestration throughout much of Australia and provides genuine and additional abatement to support Australia's transition to net zero.

This paper describes how the ACCU Scheme ensures that projects registered under the HIR method earn carbon credits based on the sequestration of carbon in native vegetation. The HIR method incentivises land managers and project proponents to regenerate native vegetation by changing their land management practices. Project proponents are awarded ACCUs based on the regeneration and carbon sequestration that occurs as a result of these changed practices. The conservative approach of the HIR method is designed to manage crediting risks if projects don't perform as expected – if regeneration stops, that is the trees stop growing, so does the crediting.

The HIR method and rules have been subject to various independent reviews (see Appendix B). All these reviews have found the method, and the Clean Energy Regulator's administration, effectively control the risks associated with regenerating native vegetation and only genuine carbon abatement is credited. For example, a 2021 analysis by Beare and Chambers[1] found strong evidence that established HIR projects have resulted in significant increases in vegetation when compared with a business-as-usual scenario in a study of projects in New South Wales and Queensland. These reviews have given confidence that the HIR method is sound and administered by a robust regulatory framework, and that these projects will deliver significant carbon abatement outcomes. Learnings from independent reviews are also informing the development of new methods being developed by the Department of Climate Change, Energy, the Environment and Water (the department) with independent assessment of their compliance against the offsets integrity standards by the Emissions Reduction Assurance Committee (ERAC).

Supporting regeneration in variable contexts

Australian ecosystems are variable and complex. Because of this, we can't be certain of the exact outcomes of activities to restore native forest and sequester carbon in woody vegetation. The regeneration and carbon sequestration outcomes of an HIR project are influenced by a range of factors. Some of these are known with reasonable certainty at the start of a project, such as geographic location, local vegetation species, climate, soil and ecological condition, current land management activities, and historical land uses. Others are more variable and can't be fully known at the start of a project, such as the availability of nutrients, presence of viable seedbanks, timing of rainfall and the effects of disturbance events on the ecosystem. As a result, regular monitoring is required to verify the progress and status of individual projects.

Although many factors affect regeneration, the most important factor in sustaining the growth of vegetation following rainfall events is the nature, extent, intensity and duration of activities that suppress the growth of native vegetation. Under the HIR method, these 'suppressors' include grazing (by livestock or feral animals), weeds, and activities that damage and destroy native vegetation.

The HIR method focuses on removing or reducing suppressors on land that has been identified as being suitable for forest regeneration. This allows native forest regeneration to occur as it would under natural climatic conditions for that area, so that regeneration can be maintained and protected from threats. In

[1] Beare S & Chambers R, 2021. Human induced regeneration: A spatiotemporal study. AnalytEcon.

addition to managing suppressors, project proponents are also responsible for managing other physical risks that could result in regeneration not occurring or not being sustained, such as protecting regenerating vegetation from bushfires and new pests. In return for supporting regeneration, project proponents generate an alternative revenue stream by earning ACCUs for the carbon sequestered as a result of the regrowth of native vegetation.

Project proponents must ensure that their HIR projects meet all eligibility requirements and are registered under the ACCU Scheme. The CER is responsible for reviewing and approving registration applications, along with ongoing verification of project performance. This includes verifying project performance and compliance outcomes based on project-specific site data, and leveraging a framework of independent, third-party auditors to ensure that credits are only issued for abatement that occurs on eligible land. The CER has various compliance and enforcement powers to respond to projects that are found to be non-compliant with the HIR method rules.

Conservative controls to manage uncertainty

In the context of Australia's diverse and dynamic ecosystems, HIR projects are expected to have variable outcomes. Some projects will exceed regeneration expectations, and others may fall short. Regeneration outcomes can also be expected to vary across the vast area of a single HIR project. To reduce the impact of these uncertainties, credits are issued incrementally based on performance. This is demonstrated through a combination of data sources and evidence obtained throughout the life of a project, including remote sensing and in-field assessment, and verified though assessment and independent audit. In-field assessment is essential to verify the performance of regeneration, particularly early-stage regrowth that cannot be reliably measured using satellite data or existing national data sets.

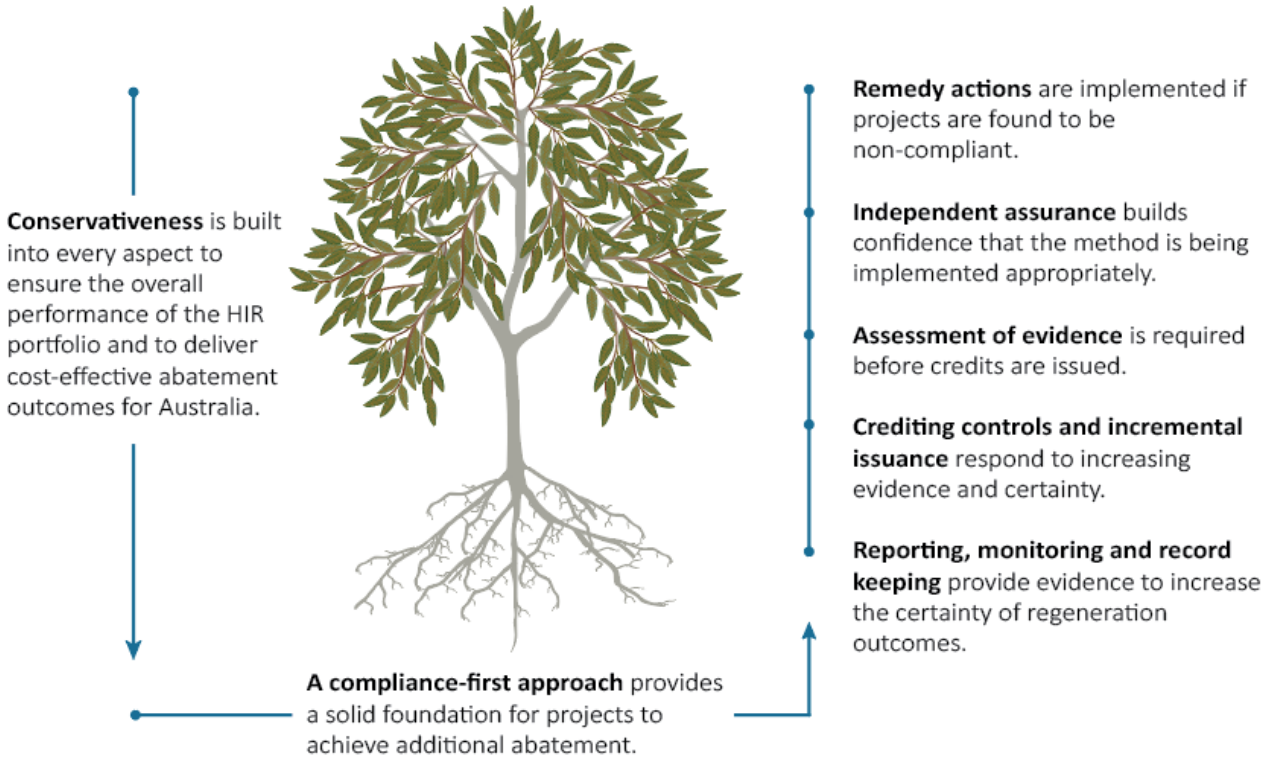
Crediting is informed by evidence from project proponents, who must prove that they are continuing to meet the requirements of the HIR method, and that regeneration is occurring. The CER verifies this information alongside evidence from independent sources, including findings from independent audits that verify on-ground data reported from individual projects.

The HIR method controls the risks associated with regeneration by requiring non-performing areas within a project to be removed. At each reporting period, project proponents must review and refine the Carbon Estimation Areas (CEAs) that are used to calculate carbon sequestration. Where an area fails to meet the strict requirements of progress in regeneration it must be removed from the project. This approach ensures that crediting aligns with actual observed regeneration and the resulting amount of carbon being sequestered. Depending on the evidence of project performance, credits may be issued, paused or relinquished.

This process builds confidence that projects remain eligible to earn credits, and that they are achieving (or are on their way to achieving) carbon sequestration outcomes.

The combination of a scientifically robust method and comprehensive administrative controls ensures that the ACCU Scheme's portfolio of HIR projects are only issued credits for additional abatement (Figure 1).

Figure 1 Conservativeness is embedded in the implementation of HIR projects, with robust controls to mitigate the risk of over-crediting.



HIR abatement to date and forecast for the future

The first HIR projects were registered in 2013, with the first regeneration events starting from around 2010.[2] Projects are credited over 25 years and must commit to a 25-year or 100-year permanence period, during which land management activities must be undertaken to reduce or remove suppressors. Carbon abatement is calculated using the Full Carbon Accounting Model (FullCAM), which is developed and managed by the Department of Climate Change, Energy, the Environment and Water (the department) and informed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO). Project performance is reported by proponents and validated by the CER and independent auditors using multiple lines of evidence, including remote-sensing data and site visits. Regeneration of native vegetation takes time, and the early stages of growth can be difficult to detect, particularly through remote sensing data coming from satellite imagery. As a result, many of the registered projects are yet to submit their first report and crediting application. By May 2024, a little more than half of all registered projects had submitted reports to be issued credits. This means the majority of abatement – and equivalent crediting – is yet to occur and will be subject to ongoing monitoring, reporting and verification (Figure 2).

[2] Under the method, the modelling start date is the date when sufficient regeneration has occurred to demonstrate that an area has forest potential and started to become native forest. This may be prior to the start date of a project.

Figure 2 Conceptual timeline of regeneration across the HIR project portfolio.

As at May 2024[3], there are 467 HIR projects registered across Australia, covering an area of 42 million hectares – more than 5% of Australia's land area. Current reporting projects cover 13.6 million hectares but not all of this area is eligible to earn credits – 4.9 million hectares of this area were determined as suitable for regeneration. Suitable areas, or CEAs, are the parts of the project area eligible to earn ACCUs based on regeneration progress. The total area of CEAs will vary over time, increasing as more projects start reporting, and decreasing if previously eligible land does not demonstrate sufficient regeneration (these areas are removed from the CEA). This re-stratification process is a key control to manage any failure in regrowth, and provides confidence in the ACCUs issued. To date approximately 5% of CEA area has been removed through the re-stratification process.

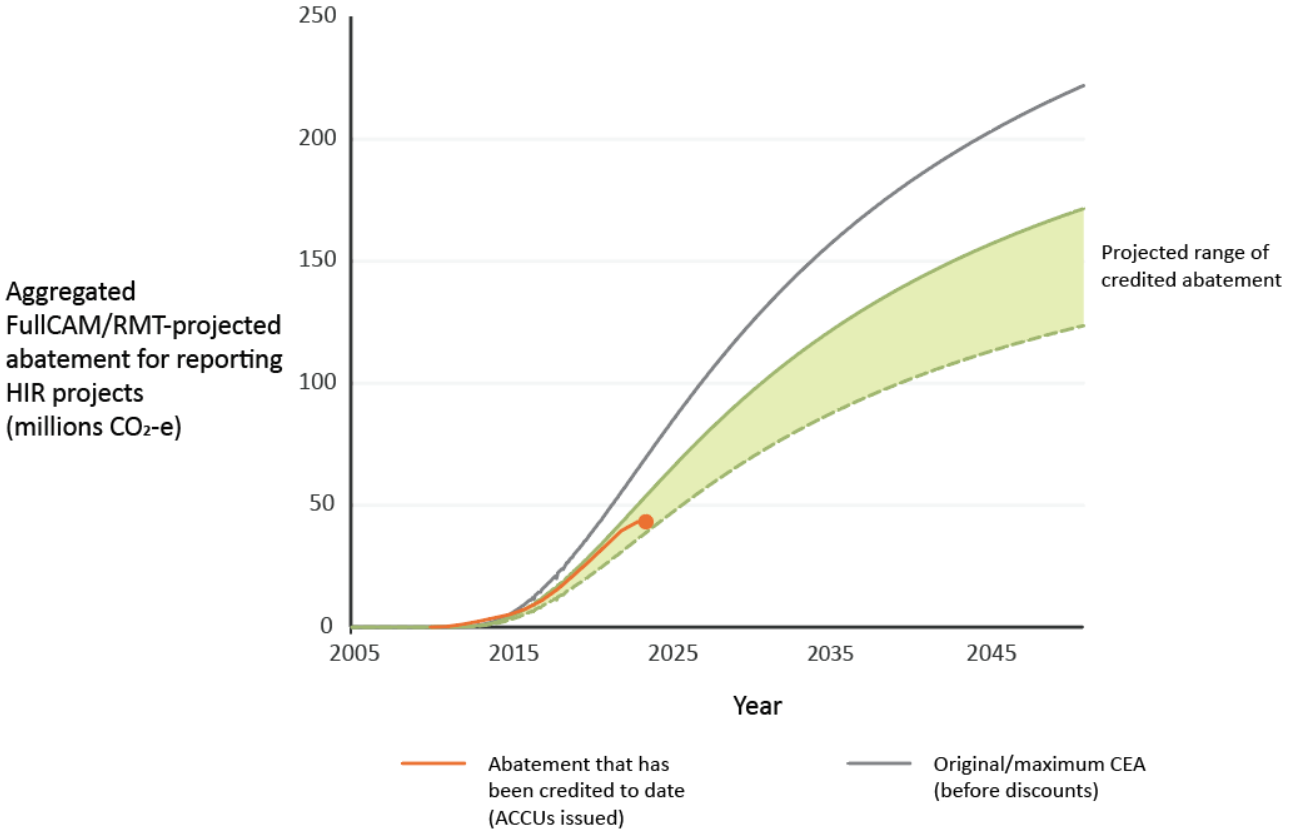
Based on their original CEA stratification for the 244 currently reporting HIR projects, the maximum amount of carbon abatement was forecast to be around 220 million tCO_2-e by the end of the last projects' crediting period. Scheme crediting discounts provide a buffer for all sequestration projects, and reduce the amount of abatement credited to around 180 million tCO_2-e. After taking account of areas that have already been removed (re-stratified), credited abatement is reduced to 170 million tCO_2-e. When accounting for further re-stratifications that are expected to occur over the life of these projects, a lower bound for credited abatement of 123 million tCO_2-e is estimated (or in the range of 123-170 million ACCUs). These currently reporting projects have so far been awarded a total of 43.2 million ACCUs. The ACCU issuance to date is in line with the above abatement forecasts, and supported by the CSIRO's independent estimates of forecasted abatement against ACCU issuance (see Appendix A).

The remaining 223 projects that are yet to report and are not included in this forecast and will progressively add to the portfolio of ACCUs credited through the HIR method. The CER will continue to track the progress of the whole portfolio over time.

[3] All data in this document is current to May 2024, unless otherwise stated.

Figure 3 shows these scenarios in the form of projected ACCUs. The CER regularly publishes updated data for ACCU projects as required by legislation.

Figure 3 Total carbon abatement forecasted for reporting HIR projects until the end of the last project's crediting period, with projected carbon abatement and ACCU issuance post scheme crediting discounts and through ongoing re-stratifcation.



Next steps

The HIR method sunsetted on 1 October 2023 due to the standard statutory 10-year time limit. No further HIR projects can be registered. The government has committed to developing a new Integrated Farm and Land Management method that includes regeneration activities and draws on the lessons learnt from the performance of existing HIR projects. Established projects will continue to operate until the end of their chosen permanence period. Based on the 25-year crediting period, the last of the HIR projects will stop earning ACCUs by around 2050 with some required to continue HIR activities beyond this date, until around 2125.

New technologies and innovations to measure regeneration are providing further assurance and validation of carbon sequestration. For example, ever-improving remote-sensing technology and field-data collection techniques have become valuable tools for project proponents to demonstrate regeneration, and also act as important data sources used by the CER and auditors to validate regeneration reports.

The experience of HIR projects will also help inform the design of future carbon abatement and ACCU methodologies to support Australia's transition to a net zero future.

Background

Key points

- Australian carbon credit units (ACCUs) incentivise carbon sequestration and abatement.
- ACCUs are issued for HIR projects that sequester carbon by regenerating native vegetation.
- The ACCU Scheme and the HIR method are governed by legislation and regulated by a framework of government and independent bodies and reviewers.
- Several independent reviews have supported the integrity of the scheme and HIR method.

Global actions to limit the extent and effects of climate change are focused on efforts to reduce greenhouse gas emissions (emissions reductions) or capture and store carbon (sequestration). The ACCU Scheme involves different types of abatement and sequestration projects – HIR projects are designed to sequester carbon.

Australian carbon credit units

As part of its commitment to addressing climate change, the Australian Government provides incentives called Australian carbon credit units (ACCUs) to encourage people and businesses to abate or sequester carbon. In the ACCU Scheme, eligible projects can earn ACCUs when they avoid or reduce emissions or when they capture and store carbon.

Human-induced regeneration (HIR) projects are designed to capture and store carbon through the growth of native woody vegetation (trees and shrubs). Projects that result in regeneration are issued ACCUs based on the level of growth and the resulting sequestration. HIR projects established under the ACCU Scheme are key contributors to carbon reduction and ACCU supply in Australia.

Over time, the ACCU Scheme and HIR method rules have been strengthened to ensure the ongoing integrity of HIR projects.

Legislation and regulatory context

Under Australian legislation, the ACCU Scheme is governed by the *Carbon Credits (Carbon Farming Initiative) Act 2011* (the CFI Act) and supported by the *Carbon Credits (Carbon Farming Initiative) Rule 2015* (the CFI Rule).

The integrity of the HIR method and credits issued under the ACCU Scheme is ensured by several bodies:

- Clean Energy Regulator (CER) – responsible for
  - registering eligible offsets projects to avoid, reduce, or capture and store carbon
  - checking that HIR projects comply with project reporting obligations
  - verifying HIR project performance
  - administering the audit framework, including registering greenhouse gas and energy auditors and ensuring they are compliant with auditor responsibilities
  - publishing project and market information and responding to cases of non-compliance in offsets projects.

- Emissions Reduction Assurance Committee (ERAC) – the independent body responsible for ensuring that ACCU methods meet the offsets integrity standards and making recommendations to the Minister who makes, varies or revokes methods
- Minister of Climate Change, Energy, the Environment and Water – responsible for making, varying and revoking ACCU methods based on recommendations from the ERAC
- Department of Climate Change, Energy, the Environment and Water (the department) – responsible for developing and maintaining FullCAM, developing new and varied methods for consideration and approval by the ERAC and the Minister
- CSIRO – responsible for informing the development of FullCAM (the model used in HIR projects to calculate carbon abatement) by providing the underpinning science and suggesting updates to the model's parameters
- registered greenhouse and energy auditors – independent parties who undertake reasonable assurance audits for individual ACCU projects to ensure a project is meeting method and scheme eligibility requirements and delivering additional abatement.

A list of relevant legislation and publications is included in Appendix B.

Independent reviews of the ACCU Scheme and HIR method

The ACCU Scheme and the HIR method has been subject to various independent reviews. For example:

- the Climate Change Authority's review (December 2023) found the ACCU Scheme is fundamentally well designed.
- Associate Professor (Honorary) Cris Brack's independent reviews of the performance of individual HIR projects passing their first 5-yearly regeneration check continue to find that HIR projects are demonstrating regeneration, project proponents are implementing the HIR activities, and that the independent audits and the CER's assessments provide strong assurance that projects meet the requirements of the HIR method
- the Australian National Audit Office's (ANAO) 2023–24 performance audit report 'Issuing, compliance and contracting of Australian Carbon Credit Units (ACCUs)' found the CER's administration of the ACCU Scheme is effective or largely effective

Further independent reviews of the ACCU Scheme and HIR method are listed in Appendix B.

Independent reviews have also proposed recommendations to strengthen the HIR method and its administration. In December 2022, an independent review of ACCUs (known as the Chubb Review) was released. The review panel concluded that the ACCU Scheme was fundamentally well designed and its arrangements are essentially sound, incorporating mechanisms for regular review and improvement. The panel recommended further improvements to clarify governance, improve transparency, facilitate positive project outcomes and co-benefits, and enhance confidence in the integrity and effectiveness of the scheme.

In 2023, the CER began implementing the Chubb Review recommendations related to HIR projects. The recommendations require that HIR projects:

- provide evidence of a causal relationship between the nominated eligible HIR activity (or activities) and the dominant suppressor(s) that occurred through the entirety of the baseline period – project proponents must select HIR activities that best address the main suppressors
- demonstrate that these suppressors are directly addressed by the HIR activity or activities throughout the life of the project – project proponents must show that the chosen activities are effectively managing suppressors

- demonstrate that the application of FullCAM is consistent with the Full Carbon Account Model (FullCAM) Guidelines.

These changes affect both new and existing HIR projects and are applied to individual projects when project proponents first apply to the CER to be issued ACCUs. This further reduces the risk of projects not performing, as every HIR project must meet these criteria before future ACCUs can be issued.

The CER website contains more information about the Chubb Review's recommendations for HIR projects.

About the HIR method

Key points

- Supporting the growth of vegetation to sequester carbon is the only means we have to remove carbon from the atmosphere at a large scale.
- HIR projects are one of the ways that Australia sequesters atmospheric carbon.
- Conservativeness is embedded into the HIR method and how HIR projects are implemented and administered. This ensures that crediting stays below actual sequestration to act as an insurance for the overall performance and cost-effectiveness of the method.
- HIR projects are a long-term investment – native vegetation takes time to regenerate and grow to establish forest cover.
- Crediting for HIR projects is incremental, responding to increasing certainty of regeneration as trees grow.
- Additionality is a requirement for all HIR projects – credits are only issued for additional sequestration that would otherwise not have occurred.
- The HIR method is a modelled approach – it uses computer modelling to calculate sequestration and credits earned. This is verified through robust and regular monitoring, including ground-truthing through site visits, to deliver a cost-effective approach to large-scale sequestration.
- The HIR method applies to the entire project area, but only land deemed suitable for regeneration is credited. These areas of land are regularly redefined (re-stratified) to reflect the dynamic nature of the landscape and ensure that credits are only issued for areas that show regeneration progress.
- The regeneration attributed to HIR projects brings multiple benefits to the land and project proponents, including restored native cover, improved biodiversity and landscape connectivity, improved soil health and soil carbon, reduced erosion, improved productivity, and diversified farm income.

Basics of the HIR method

The value of the HIR method is based on the natural ability of plants to remove carbon from the atmosphere – this is currently the only way we can sequester carbon at a large scale.

The HIR method works by introducing new land management practices to regenerate native forests where regrowth has been restricted by livestock grazing, feral animal grazing, plants not native to the area, or mechanical or chemical damage or destruction. When these suppressors are removed, native vegetation can regenerate to sequester carbon.

The method only applies to areas that have the potential to regenerate native trees and shrubs, where suppressors have prevented or limited regrowth for at least 10 years immediately before the project start date. By changing their land management practices, project proponents remove or reduce these suppressors, allowing native vegetation to naturally regenerate from existing seedbanks in the soil.

Like all ACCU Scheme methods, the ERAC has assessed the HIR method as meeting the offsets integrity standards in giving its recommendation for the making of the method. This means the method is considered to result in additional carbon abatement, that estimates of carbon abatement are conservative, and is supported by clear and convincing scientific evidence.

HIR projects under the ACCU Scheme have a permanence period of either 25 or 100 years. All projects have a crediting period capped at 25 years.

> **Crediting period** refers to the period for which HIR projects are entitled to receive ACCUs. HIR projects have a 25-year crediting period (the same as other sequestration projects under the ACCU Scheme).
>
> **Permanence period** refers to the period for which sequestration projects (including HIR projects) must legally protect the carbon stock that ACCUs have been issued for. Project proponents can choose either a 25-year or 100-year permanence period. The 25-year period is subject to a 20% reduction in ACCU issuance to help buffer against carbon losses across all projects. The permanence period commences within the crediting period at the time of first ACCU issuance and will extend beyond the crediting period.

Designed for conservativeness

The design and implementation of the HIR method incorporate several measures to ensure that abatement is credited conservatively. Credits are issued only for revegetation on land that has forest potential (CEAs) and ultimately achieves forest cover. This is supported by responsive measures such as re-stratifying CEAs. Projects are also likely to have many sources of abatement that are not credited, such as from regeneration that occurs outside of CEAs as a result of changed land management activities. Scheme buffers and discounts are also applied as insurance to account for temporary carbon losses or shorter project permanence periods.

> **Conservativeness**, at a project level, conservativeness refers to the design of the HIR method to ensure carbon abatement estimates are likely to underestimate the amount of carbon sequestration that occurs as a result of changed land management activities.

Additionality shows land management outcomes

The additionality principle recognises that reducing or removing suppressors through changes in land management practices is the most significant contribution to regeneration.

> **Additionality** in the ACCU Scheme refers to carbon abatement that is unlikely to occur in the ordinary course of events. In the HIR method context this refers to HIR activities causing sequestration that is unlikely to occur in a business-as-usual scenario.

Regeneration of woody vegetation in a landscape is affected by many factors, and careful management is needed for regeneration to occur and be sustained. Rainfall is essential for plant growth, and individual rainfall events can increase regeneration in the short-term. However, over the life of an HIR project, it is the longer-term climate patterns that determine regeneration rates and underpin the modelled estimates. To allow the vegetation to make use of natural rainfall patterns, the regenerating land must be protected from

suppressors and natural disturbances (such as fire). This encourages the regrowth of woody ecosystems that are adapted to the local geography and climate.

HIR projects must demonstrate that they expect to achieve (and only be credited for) additional abatement. This involves providing evidence that the regeneration of native vegetation has been limited by suppressors for at least 10 years before the project start date, and that the chosen HIR activities can be reasonably expected to manage the suppressors to allow regeneration to occur (see Eligibility and registration). However, crediting is driven by long-term trends in rainfall at the project location. If actual rainfall is much less than average over an extended period (like in an extended drought) and trees do not regenerate, areas that can no longer be expected to attain forest cover must be removed and crediting ceases. Conversely, if circumstances are such that more land regenerates than has initially been stratified in CEAs, these areas are not credited (the proponent may subsequently add these areas into CEAs if they meet requirements, but do not receive credits for the regeneration that has previously occurred). Projects therefore bear the downside risk attached to climate but not the upside risk.

Using additionality as a requirement and measure for tracking and crediting HIR projects has been supported by detailed reviews of the HIR method, including the 2019 ERAC review of the method, the independent ACCU Review (also known as the Chubb review) and the statistical analysis by Beare and Chambers. These reviews supported the additionality of carbon abatement in the HIR method to be reasonable and that the method has integrity.

Questions about how additionality is applied in the HIR method prompted these reviews. Concerns were previously raised about the possibility that suppressors were not present in the first place or were not being effectively removed or managed. The impact of changed management practices has also been questioned, particularly whether rainfall contributes more to regrowth than managing suppressors does. Although rainfall is needed to trigger and sustain regeneration events, adequate rates of ongoing regrowth to achieve forest cover can only be sustained if suppressors are managed.

In practice, a range of changed land management activities are undertaken across the whole of a project area and must be sustained throughout the life of the project. The majority of projects are managing the removal of multiple suppressors to support regeneration. Proponents must also actively manage the project to respond to changing circumstances, such as alleviating grazing pressure during drought when regenerating vegetation is particularly vulnerable. This illustrates the holistic management change that is required to ensure that carbon is additional over the long term. This is supported by the scientific evidence that shows that the combination of land management, with rainfall, is necessary for ecosystem recovery and increased sequestration of carbon in vegetation systems over time.

Added to this, the method also ensures conservativeness through the 'extra' regeneration occurring outside of credited CEAs in the wider project area. Because changed land management practices are typically occurring beyond the CEAs, credited abatement is likely to be less than the overall abatement achieved by the additional activities introduced through the management of a HIR project. As such, there is high confidence that HIR projects result in more abatement than is credited (see Uncredited abatement).

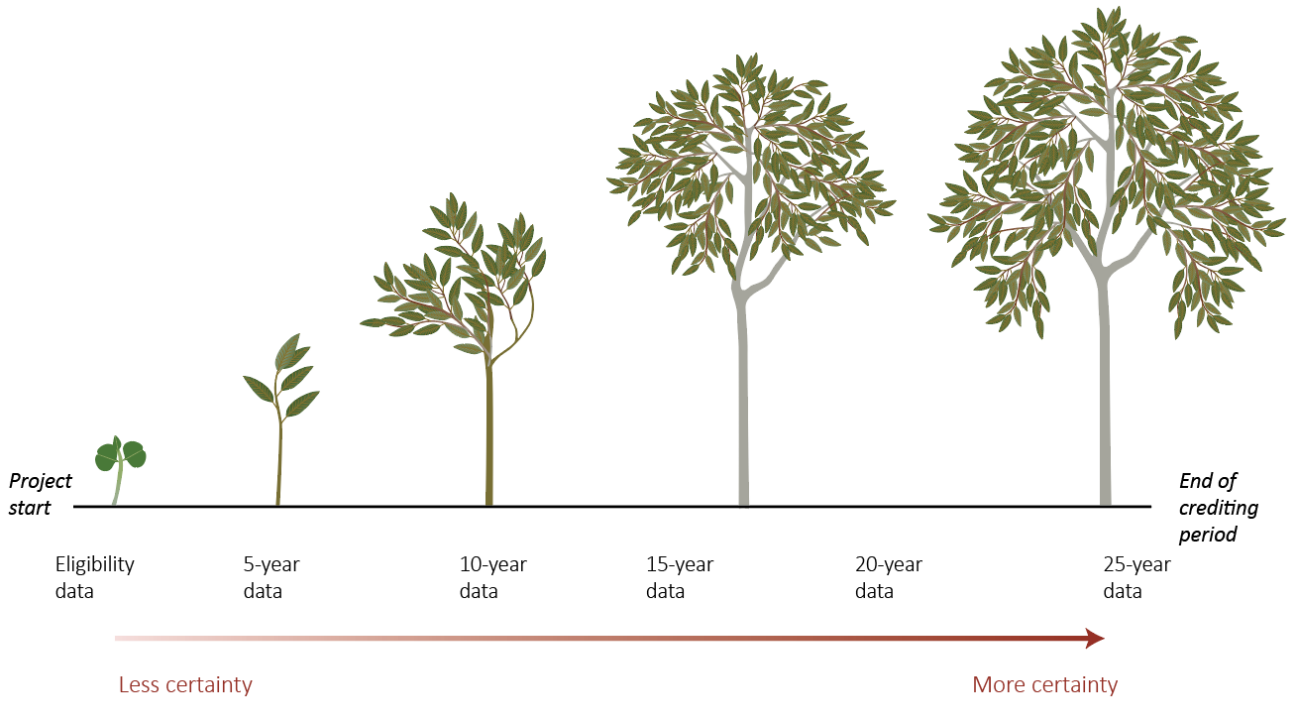
Uncertainty is managed with incremental crediting

Regeneration is a long process – trees take time to grow, especially in arid regions, and early growth can be difficult to detect. The most advanced HIR projects are only in year 11/12 – and are not yet required to have achieved all their forecasted regeneration.

Many variables over the life of a project may affect its ability to achieve its originally forecasted abatement. Additional complexity and uncertainty exist because the ecosystem's response to reducing suppressors cannot be fully known until it happens. The presence and rate of regeneration varies throughout the life of a project, so regular monitoring is conducted to reveal where regeneration is occurring within the project area, and whether forest cover has been attained or is likely to be attained.

Crediting occurs incrementally with monitoring to manage the risk of over-crediting (Figure 4). An offsets report with information and evidence of regeneration progress and the implementation of activities is typically submitted between every 3 to 12 months. In addition, project proponents are required to submit regeneration data at least every 5 years to show progress to attaining forest cover. Some projects will attain forest cover as expected, and others won't. In these cases, areas of land that no longer show progress to attaining forest cover are removed from CEAs and are not credited (see Carbon estimation areas evolve to respond to changes in forest potential). If credits have already been issued for underperforming areas, there are options for the project to balance abatement with crediting (see Pauses to crediting).

Figure 4 Incremental crediting responds to increasing data and certainty. Regeneration data must be submitted by project proponents at least every 5 years.



Many projects are yet to begin crediting. As of May 2024, the number of ACCUs issued is 43.2 million. This in line with FullCAM forecasts, as verified by the CSIRO (see Appendix A).

Scheme buffers and discounts provide insurance against carbon losses

Buffers and discounts to crediting are built into the scheme to account for temporary carbon losses and the uncertainty of ongoing carbon storage for projects with shorter (25-year) permanence periods. This is an important source of conservativeness in HIR projects to help protect against the inherent uncertainty of the total level of abatement achieved during and after the project permanence period.

The **risk of reversal buffer** provides a scheme-wide buffer for temporary carbon losses from sequestration projects caused by widespread natural disturbances. As of 2024, impacts from such disturbances have not resulted in substantial carbon loss. For example, in the 2019–20 fire season, only 1% of projects across a range of methods were affected, none exited the scheme and all are subsequently regenerating. The buffer works as a 5% discount to net abatement, which is applied to all ACCU Scheme sequestration projects. This means that HIR projects will only be credited for, at most, 95% of their verified abatement.

A **permanence period discount** provides a further 20% discount to net abatement projects with a 25-year permanence period (as opposed to those with a 100-year permanence period). This means that 25-year projects are awarded credits for a total of 75% of their verified abatement (20% permanence period

discount plus the 5% risk of reversal buffer). This discount is to balance any carbon losses or reduced regeneration that may occur after the 25-year project period – for example, if suppressors are reintroduced.

Carbon estimation areas evolve to respond to changes in forest potential

A major milestone of HIR projects is to attain forest cover between year 15 and year 20 of the project.

> **Forest cover** occurs when an area of at least 0.2 hectares has trees and shrubs that are 2 metres or more in height and provide crown cover across at least 20% of the land.
>
> **Forest potential** is present when an area of at least 0.2 hectares has trees and shrubs that *have the potential* to reach at least 2 metres in height and provide crown cover across at least 20% of the land. The certainty that a given area of land has forest potential increases over time as the project is implemented and more data are collected.

Forest potential and progress towards attaining forest cover are measured using spatial data and in-field verification, including detailed measurements, such as stem density measurements and species counts by project proponents and third-party auditors. This monitoring is required during the entire project permanence period but is especially important during the project's 25-year crediting period. This is to ensure that ACCUs are appropriately issued and to inform responsive actions such as adjusting project activities, pausing modelling if regeneration is disrupted and not on track to attain forest cover, and updating (re-stratifying) CEA boundaries to remove areas that no longer have forest potential.

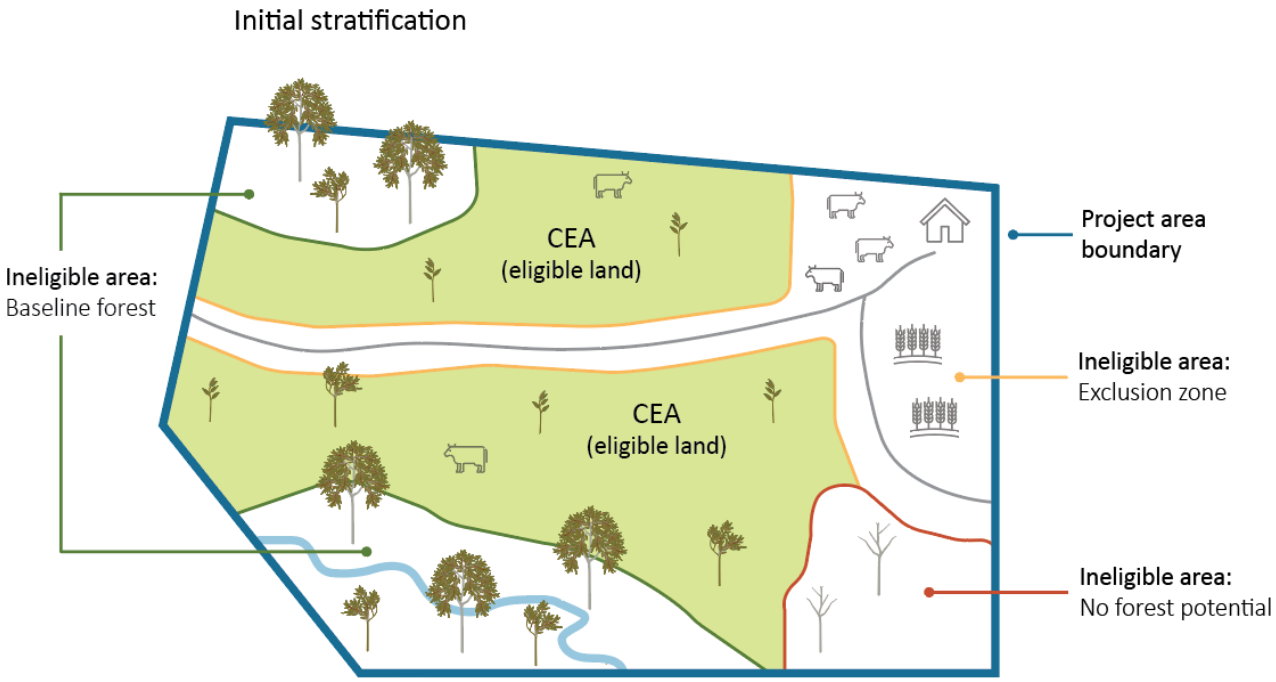
> **Project area** is the area covered by the project proponent's property (or properties) registered for an individual HIR project. Not all the land within a project area will be eligible for crediting – carbon estimation areas (CEAs) are defined within the project area to ensure that only areas that meet eligibility requirements and continue to show forest potential are credited.
>
> **Carbon estimation areas (CEAs)** are areas that have been determined as suitable for regeneration by the HIR project requirements. CEAs are the only parts in a project area that are eligible for crediting.

At the start of the project, CEAs are defined (stratified) to ensure that only eligible land is assessed for crediting. A single project may have multiple CEAs to reflect different regeneration events across the landscape. A single CEA is defined as an area of eligible land having:

- a similar mix of native vegetation that has been regenerating for a common length of time
- a common history of management activities and disturbance events.

To ensure that regeneration is forecast appropriately, FullCAM considers the unique attributes of each CEA within the project for the initial stratification (Figure 5).

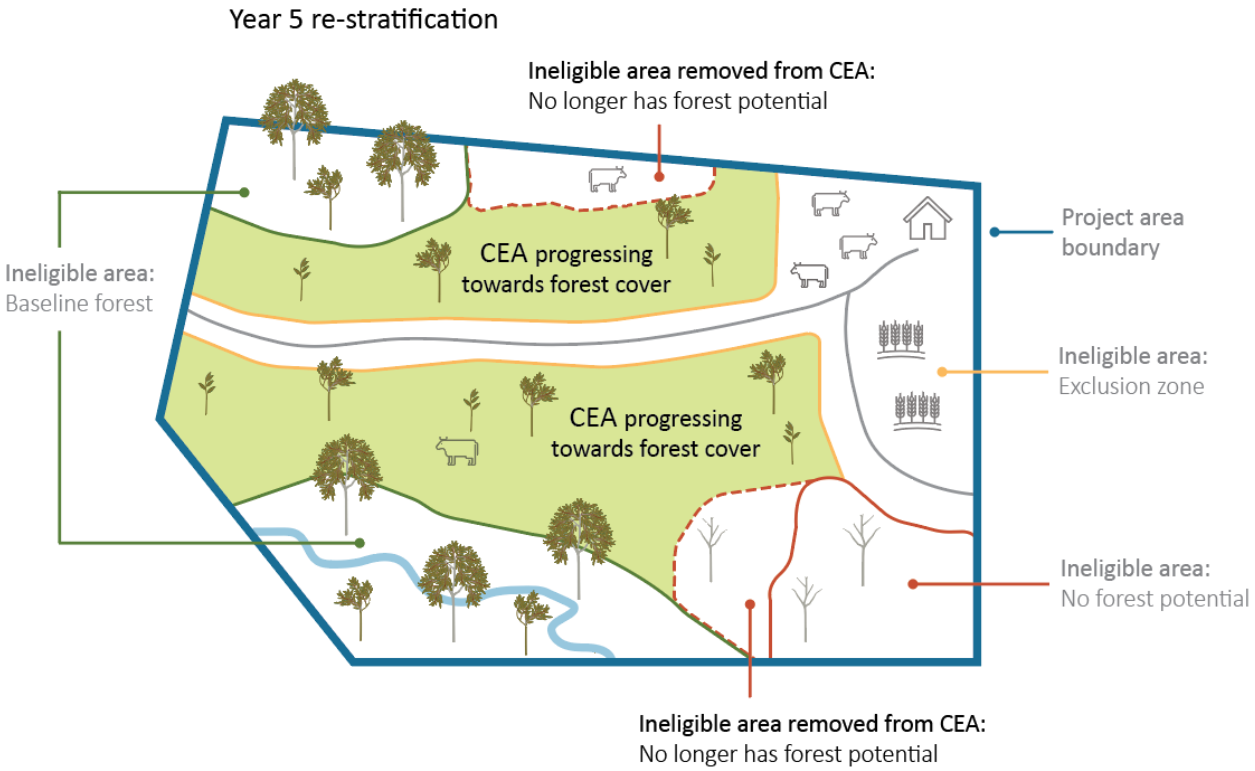
Figure 5 The initial stratification of an HIR project area, showing CEAs containing eligible land with forest potential and excluded ineligible land (baseline forest and land with no forest potential)



CEAs range in size, typically between 0.2 hectares and many thousands of hectares. On average, CEAs currently represent 35.8% of their project area, highlighting that not all parts of the project landscape have forest potential. Because forest potential changes over time and is not uniform across the full geographic area of an HIR project, there is a degree of uncertainty in the initial estimates of forest potential and CEA boundaries. To reduce this uncertainty, CEAs are progressively re-stratified throughout the life of the project, based on the presence or absence of regeneration and forest potential (Figure 6).

This re-stratification allows projects to adapt to variability in regeneration performance and to remove any land that is no longer eligible (for example, land that no longer has forest potential). As projects progress, CEAs tend to reduce in size during the crediting period to reflect the change in land that is eligible for crediting. As of May 2024, projects less than 5 years old have 99.68% of their original CEA remaining, whereas projects more than 10 years old have 94.48% of their CEA remaining. If new areas emerge with forest potential within the project area, they can be stratified as a new CEA; however, these areas must meet all other eligibility requirements and only earn credits for regeneration that occurs from that time onwards (credits cannot be back-dated).

Figure 6 First re-stratification of an HIR project area showing the change in CEAs as areas lose forest potential – these areas removed from CEAs are no longer eligible to earn ACCUs.



Project proponents are responsible for appropriately defining initial CEAs and re-stratifying CEA boundaries throughout the project's crediting period. The CER verifies CEA boundaries through regular assessments and audits, drawing on multiple lines of evidence. Each re-stratification gives more confidence that crediting is only being applied to eligible land that is regenerating.

Modelling reduces the cost of calculating abatement and credits

Carbon abatement and regeneration progress is calculated throughout the life of the project using FullCAM and its predecessor, the Reforestation Modelling Tool. The use of a model lowers the cost of estimating abatement, which would otherwise be significant given the large areas of land that are subject to HIR project activities. Specific eligibility criteria and regular checks and audits throughout the life of a project ensure that the model is only applied to eligible land using parameters that reflect the nature of each CEA.

About FullCAM

FullCAM is a computer modelling tool developed by the Department of Climate Change, Energy, the Environment and Water (the department), with underpinning science and model guidance provided by the CSIRO. One of its uses is to estimate carbon abatement in regenerating systems. It does this by estimating changes in carbon stock in the form of biomass in trees and woody debris. The model is informed by calibration plots taken from a range of ecosystems across Australia, including within HIR project environments.

As with any model, FullCAM cannot accurately predict the level of abatement that will actually occur for any given location but it has proven to be generally non-biased when applied regionally[4]. This makes it suitable for providing robust estimates of abatement at the portfolio level for HIR projects. The department updates FullCAM to reflect the latest science and improve usability. The CSIRO provides the underpinning science and suggests improvements to the model.

How FullCAM is applied to HIR projects

The modelling approach is based on simulating the regeneration that occurs over the 25-year crediting period of the project. The latest version of FullCAM must be used along with the appropriate FullCAM option for projects that qualified for transition arrangements. Project proponents apply the model for the specific set of conditions relevant to their project, such as the areas that are regenerating (the CEAs), when regeneration started, and losses from disturbance events such as fires. The model then estimates the amount of carbon abatement which informs the number of ACCUs that are issued to a project (1 ACCU is issued for net abatement of 1 tCO_2-e after applying scheme crediting discounts).

The future of the HIR method

The HIR method sunsetted on 1 October 2023 due to the standard statutory 10-year time limit. This means no new projects can be registered under the method. Existing projects can continue to receive ACCUs for the remainder of their crediting period where they demonstrate regeneration towards attaining forest cover. A new regeneration method is being developed by the department, as prioritised by the Minister for Climate Change and Energy. The ERAC will assess the method against the offsets integrity standard and advise the Minister regarding the making of the method.

[4] Paul, KI and Roxburgh, SH (2024). *Verification of FullCAM's Tree Yield Formula for Regenerating Systems*. CSIRO, Australia. https://publications.csiro.au/publications/publication/PIcsiro:EP2022-5251

Uncertainties and risks in HIR projects

Key points

- The regenerating vegetation in HIR projects is exposed to physical risks, such as grazing by stock, pests and native animals, fire, variable rainfall and other climate events. Project proponents are responsible for mitigating physical project risks, and responsibilities are clearly defined before projects are registered.
- There are many uncertainties in regenerating native forest to sequester carbon, including uncertainty around how the ecosystem will respond to HIR activities and any physical risks that occur. Uncertainty reduces with time as regenerating vegetation matures and more data are collected over the life of the project.
- HIR projects also face administrative risks that could lead to over-crediting. The CER implements various controls to mitigate administrative risks and ensure credits are not issued for abatement that has not occurred.

The regeneration outcomes of an HIR project are heavily influenced by how existing suppressors are managed. But uncertainty exists around how each ecosystem will respond to management activities. This uncertainty is due to the complexity and variability of ecosystems, with each project being influenced by different factors such as:

- geographic location, rainfall and local climate, including future climate change
- local native vegetation species
- availability of nutrients and viable seedbank
- disturbance events, such as fire, and the ability of the ecosystem to recover from such events
- soil and ecological condition
- distribution and pattern of flow of water across the landscape
- nature, extent, intensity and duration of current and previous land uses
- suppressors that appear after the project has started, such as new feral animals and non-native weeds

These factors pose risks to the level of regeneration that will occur throughout the life of a project and, therefore, influence the level of sequestration and amount of ACCUs issued.

Individual projects will face a number of these risks throughout their lifespan. Project proponents are generally responsible for managing the risks to regeneration, with the incentive for mitigation being that ACCUs will only be issued based on progress towards achieving forest cover in CEAs. Administrative risks also exist, which may result in poor estimations of regeneration, leading to over- or under-crediting.

Types of risk and how they're mitigated

There are many risks to the performance and crediting of HIR projects. These are considered as either physical risks or administrative risks.

Physical risks are related to the performance of the project compared with its regeneration expectations. Physical risks may be attributed to land management actions, climate variability, geographic location, ecological condition or previous land use.

Key physical risks include:

- CEAs not achieving forest cover by the forest cover attainment date (generally between year 15 and year 20)
- CEAs achieving but not sustaining forest cover for the remainder of the project's crediting and permanence period
- loss of vegetation due to disturbances such as fire and drought.

Project proponents largely manage the physical risks through their HIR land management practices. Depending on the property and type of suppressors being managed, these HIR activities could include:

- removing, reducing or changing the types of livestock that are present
- changing livestock grazing regimes
- building new fences to exclude livestock and feral animals
- undertaking a combination of feral animal management strategies.

Along with activities to manage suppressors, proponents also need to manage other physical risks – for example, managing risks associated with bushfire.

If physical risks materialise, regeneration can be negatively affected and lead to the risk of over-crediting. The controls built into the HIR method and its administration help avoid this crediting risk. For example, the method requires projects to adapt to ensure that credits are not issued for regeneration that has not occurred. This includes re-stratifying CEAs to remove land that no longer has forest potential and introducing growth pauses where regeneration is suppressed or where regeneration expectations are not aligned with projected carbon abatement.

Administrative project risks are related to the calculation of regeneration, abatement and the issuance of ACCUs. These risks may be attributed to CEA stratification, reporting or data collection.

Key administrative risks include:

- overestimating or underestimating carbon sequestration due to applying the model to ineligible areas of land
- inaccurate identification of areas of pre-existing forest cover and forest potential due to inadequate stratification tools and field data
- inaccurate reporting of regeneration and HIR activities.

Administrative risks can lead to over-crediting. Checks and controls that are built into the HIR method and model mitigate these risks. Project proponents also manage these risks through compliance with ongoing monitoring, reporting and record-keeping requirements. These risks are further mitigated by the assurance role of the CER, along with third-party independent auditors who conduct reasonable assurance audits throughout the crediting period. If false or misleading information has been submitted, the CER can require ineligible credits to be returned.

The ERAC has also played a role in mitigating risks associated with the method by ensuring that it met the offset integrity standards. The FullCAM model and the method are managed by the department.

A summary of risks and controls to mitigate risks of over-crediting is in Appendix C.

Compliance and crediting controls

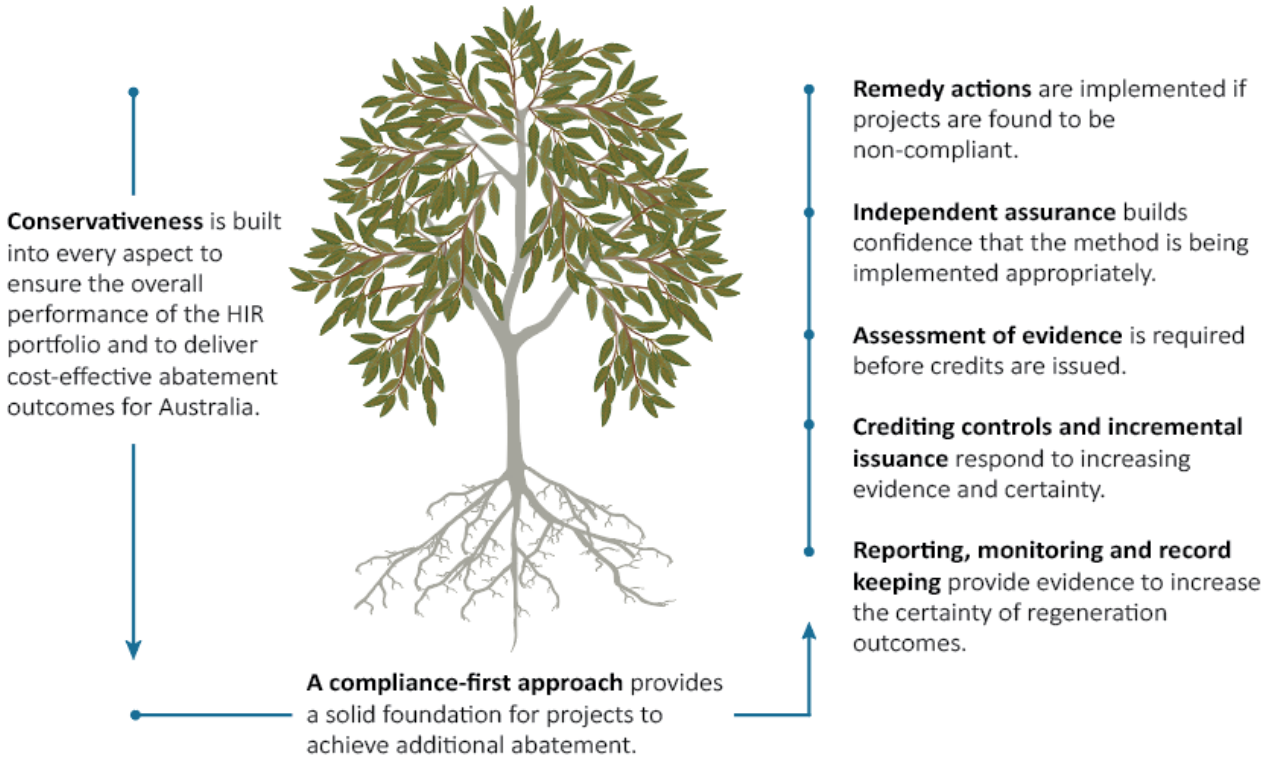
Key points

- HIR projects have the potential to sequester large amounts of carbon. However, credits are only issued incrementally as regeneration progresses to forest cover.
- The HIR method is designed to manage uncertainty in project outcomes to reduce the risk of over-crediting. This involves clearly outlined responsibilities for project proponents to implement, monitor and report on HIR activities and regeneration outcomes, and for the CER and independent auditors to verify reports using multiple lines of evidence.
- The CER is committed to ensuring that only carbon sequestered and maintained during a project's crediting period is credited.
- In addition to the CER's role in verifying project performance and compliance, third-party audits provide independent assurance to ensure that projects are not over-credited.

There are many entities involved in the performance and administration of HIR projects, including ERAC, the Department of Climate Change, Energy, the Environment and Water, project proponents, and carbon service providers that support project proponents to manage their projects. These parties play important roles in ensuring the compliance of projects in delivering carbon abatement and the integrity of methods under which they operate. This section focuses on the controls used to respond to uncertainty and mitigate the risk of over-crediting.

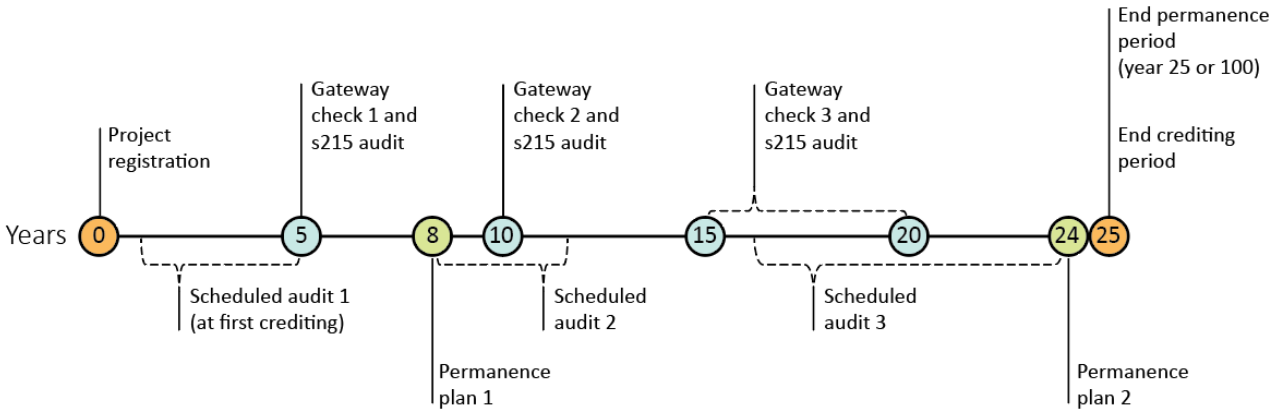
Independent reviews of the ACCU Scheme show that HIR projects have the potential to successfully sequester carbon at a large scale. To ensure that only additional carbon abatement is credited, a set of rigorous controls are applied (Figure 7).

Figure 7 Robust controls mitigate the risk of over-crediting.



These controls are implemented in different ways throughout the life of a project. Figure 8 shows a high -level scenario of when key controls are implemented throughout the life of a project.

Figure 8 A simplified example of when key controls are implemented throughout an HIR project.



Upfront compliance

The CER's ACCU Scheme Compliance and Assurance Framework applies an active, upfront assurance framework to ensure that ACCUs issued for HIR projects represent additional abatement according to the legislation, rules, HIR method and tools used to measure abatement (Table 1). This approach can be thought of as a 'preventive' approach to encourage compliance with the ACCU Scheme by applying careful checks when projects are registered and when ACCUs are issued. If evidence shows that a project is noncompliant, actions will be taken to get the project back on track (see Crediting controls).

Table 1 Summary of compliance milestones and their requirements and controls.

Compliance milestone	Key compliance requirements	Key compliance controls
Registration	• Additionality • Legal right and consents • Fit and proper person • Project contains eligible land • Suppression during baseline	• Proponent-supplied information and evidence • CER assessment to verify application using multiple lines of evidence
First offsets report	• All regulatory approvals and consents must be obtained • CEAs comprise of eligible land • Implementation of HIR activities • CEA stratification meets method and guideline requirements • Causal relationship between suppression and HIR activities	• Proponent-supplied information and evidence • CER assessment to verify application using multiple lines of evidence • Independent third-party audit
Regeneration gateway checks (year 5 and 10)	• CEAs are progressing towards forest cover • Ongoing implementation of HIR activities • CEA stratification meets method and guideline requirements	• Proponent-supplied information and evidence • CER assessment to verify application using multiple lines of evidence • Independent third-party audit • Expert review
Forest cover assessment gateway check (between years 15 and 20)	• CEAs have attained forest cover • Consistent approaches used to identify forest cover attainment and exclude pre-existing forest cover	• Proponent-supplied information and evidence • CER assessment to verify application using multiple lines of evidence • Independent third-party audit • Expert review

Eligibility and registration

Potential projects must meet several eligibility requirements to become a registered HIR project. Many of these requirements are based around the concept of additionality to ensure that only eligible land with the potential to attain forest cover is classified within CEAs.

- Proponents must demonstrate that eligible areas of land within the project area have been subject to one or more suppressors during the 10 years before the project start date. These suppressors must have prevented the area from attaining forest cover. Suppressors include livestock, feral animals, plants not native to the area, and mechanical or chemical destruction of vegetation

- Proponents must undertake eligible land management activities (HIR activities) in a way that can reasonably be expected to result in the area becoming native forest, and attaining forest cover, through regeneration. Activities may include
  - excluding livestock and the taking reasonable steps to keep them excluded
  - managing the timing and extent of grazing
  - managing feral animals humanely
  - managing plants that are not native to the project area
  - permanently ceasing the mechanical or chemical destruction, or suppression, of regrowth.
- Native forest must not have been cleared during the 7 years (or 5 years, if the land was sold) before the project start date
- Any areas with existing forest cover are excluded from CEAs
- Commit to a permanence period of either 25 years or 100 years. The permanence period places an obligation on the project proponent to implement the HIR activities and protect the credited carbon stock for the duration of the selected permanence period.

To inform the ongoing eligibility of a project (including verifying whether it meets gateway check requirements), the CER uses a range of data sources to verify that projects are performing as expected, and that crediting is based on additional abatement.

Roles

Everyone has a role in ensuring compliance in HIR projects. The method requirements clearly outline the compliance expectations for project proponents, with the CER for other parties such as independent auditors ensuring that these requirements are met.

Project proponents

As part of an HIR project, proponents must:

- provide evidence to show that they meet eligibility requirements, including stratification of CEAs and re-stratification following disturbance events and if forest potential is lost
- satisfy the additionality test for project registration by demonstrating the presence of suppressors in the baseline period through their pre-existing management approach and implementing management changes that carry a reasonable expectation of forest regeneration
- manage their project areas carefully, especially in semi-arid and arid environments where nuanced and careful judgements are required
- actively and diligently manage the landscape to mitigate disturbance events.

Clean Energy Regulator

The CER is responsible for overseeing HIR projects to verify that proponents are complying with the method requirements. The CER:

- is responsible for administering the registration and crediting of projects under the ACCU Scheme
- applies an active upfront assurance framework to ensure that ACCUs that are issued represent additional abatement according to the legislation, rules, and relevant method and applied tools
- uses multiple lines of evidence to verify forest potential and progress towards forest cover; for example, site visits in the early stages of a project to identify regeneration that cannot yet be detected by remote-sensing technologies

- requires additional information and evidence if the CER is concerned that project requirements may not be met – the CER will not issue ACCUs until sufficient information has been provided
- checks a project's progress towards becoming a forest every 5 years – if a project cannot demonstrate regeneration, non-performing areas must be removed and crediting for that project is paused until the project returns to a positive net abatement position – this allows the project to 'catch up' as trees grow
- enforces compliance when preventive steps have not been successful; in practice, this is rare because compliance levels are high. For example, CER can initiate investigations and enter into a voluntary but enforceable undertaking with the scheme participant.

Independent auditors

Independent auditors are responsible for auditing the information provided by project proponents. These audits are in addition to the CER's assessment of project performance.

The independent auditors must:

- be on the Register of Greenhouse and Energy Auditors
- follow the Code of Conduct set out in the National Greenhouse and Energy Reporting Regulations 2008
- meet fit and proper person requirements
- act independently and perform objective audits
- maintain adequate insurance
- participate in at least 3 audits under schemes the CER administers every 3 years, which may include ACCU Scheme audits
- complete 15 days or 112 hours of professional development for every 3-year period of their auditor registration
- report to the CER annually
- participate in reviews and inspections of their registration and performance
- keep adequate records related to an audit for 5 years from the audit date.

Continually improving compliance

Compliance practices continue to improve for HIR projects. For example:

- the CER improved (and continues to improve) compliance practice in response to the tightening of legislative requirements for the HIR method in 2019. This included strengthening rules for evidence collection and record keeping, including the requirements for project proponents to provide evidence that the stratification of CEAs are appropriate and continue to progress towards forest cover
- improvements were made following the release of the 2022 ACCU Review, including reassessing the eligibility of project activities to address baseline suppressors, introducing additional independent gateway audits, and engaging an independent expert to provide additional assurance on the performance of the HIR project portfolio through the gateway assessments.

Other improvements are also made continuously as further data are collected and analysed as projects mature. The CER has requested more information and evidence from project proponents to lift project reporting to best practice. Evolving technologies and the HIR activities undertaken by project proponents bring further opportunities to improve project performance and compliance.

Reporting, monitoring and record keeping

Monitoring regeneration is largely the responsibility of project proponents, with the CER assessing and verifying proponent information, supported by third party auditors' reasonable assurance audits. Project proponents are also required to demonstrate progress towards forest cover at years 5 and 10, working towards attaining forest cover by year 15. Proponents must submit evidence with each 5-yearly gateway offsets report to demonstrate that their project is meeting its regeneration and forest cover requirements (as outlined by the legislation and HIR method). The CER is responsible for ensuring that proponents comply with these requirements.

The submission and verification of monitoring evidence is part of the CER's broader regulatory framework that supports the integrity of the ACCU Scheme. The evidence base is subject to continuous improvement – for example, by incorporating big data such as light detection and ranging (LiDAR) technology, and machine-learning capabilities as they become available.

Offsets reports

Offsets reports are the key requirement of participation in the ACCU Scheme and must address a range of legislative and HIR method requirements. Project proponents are required to submit offsets reports between every 6 months and 5 years. For each 5-yearly gateway check, the offsets report must include evidence to demonstrate compliance with the gateway requirements.

Offsets reports must cover:

- net abatement amounts
- CEAs and modelling points on a geospatial map
- data on emissions from biomass burning and fuel use
- FullCAM files and output data
- project activities and how they're undertaken
- evidence to demonstrate compliance with the relevant gateway requirements, when applicable.

Project proponents calculate abatement outcomes (see Modelling reduces the cost of calculating abatement and credits) and submit this with supporting data to the CER as part of their crediting application. The CER assesses the application to determine if the evidence provided meets all reporting requirements and, if applicable, whether ACCUs will be issued and how many. If the CER verifies that the proponent-supplied evidence reflects regeneration to the appropriate threshold, ACCUs will be issued for that level of abatement.

Permanence plans

Project proponents must monitor and report on regeneration for the entire project permanence period. For projects with a 100-year permanence period, this means proponents continue to conduct HIR activities, monitor for bushfires and loss of forest potential, and submit at least 5-yearly offsets reports after the 25-year crediting period until year 100.

Project proponents must provide permanence plans at years 8 and 24 (projects declared after 2018 must also provide an initial permanence plan at project registration). Permanence plans must include an explanation of steps that participants intend to take, or have already taken, to ensure that carbon remains sequestered for the permanence period (25 or 100 years).

If proponents intentionally damage carbon stocks during the permanence period, or if they don't take adequate steps to protect carbon stocks, the CER may issue an official relinquishment notice for proponents to return the relevant amount of ACCUs.

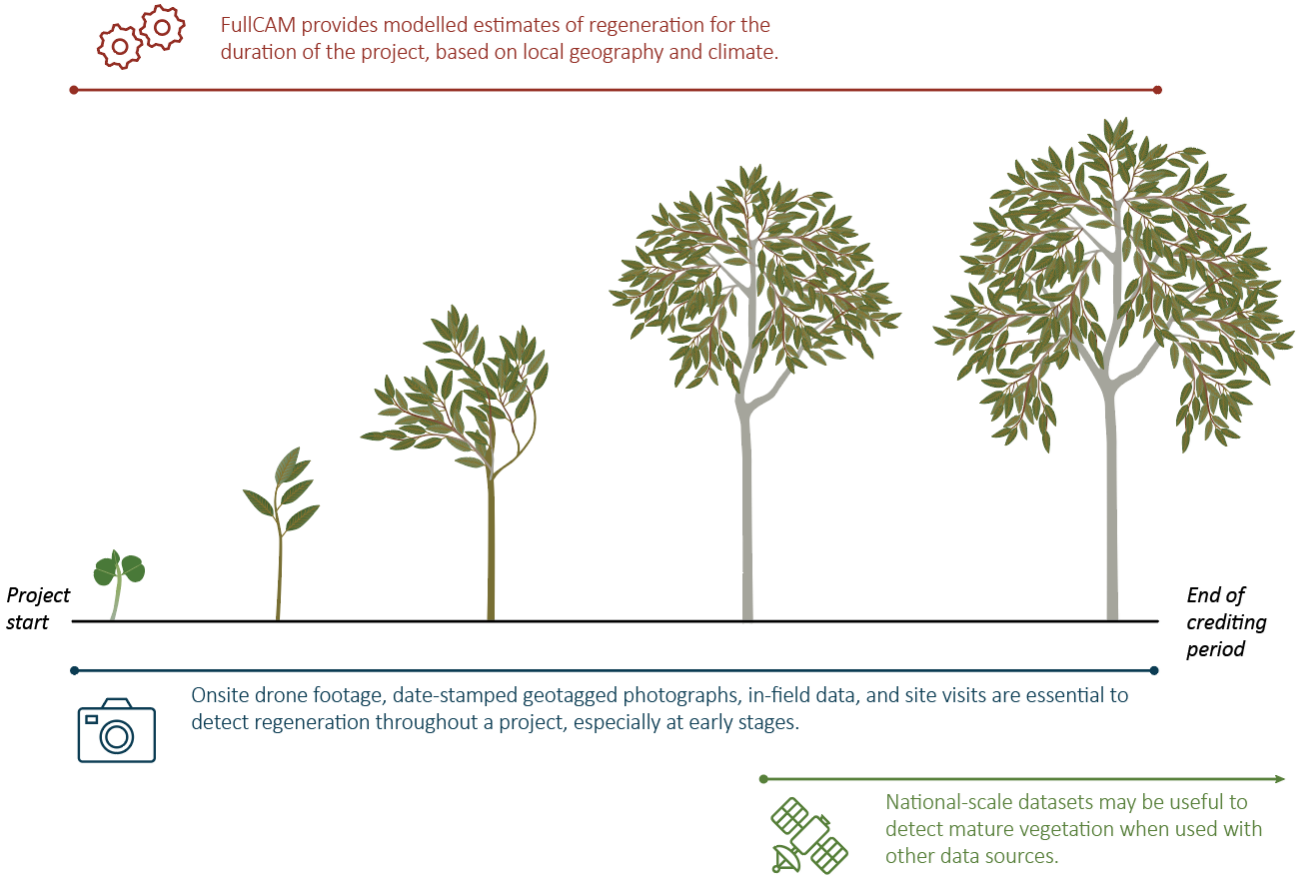
Remote-sensing data

Under the ACCU Scheme, project proponents develop their own remote-sensing tools trained from locally sourced sample plots within the project area. These tools are used to determine the extent of existing forest cover and forest potential on the property, and track regeneration progress over time (Figure 9).

The choice of remote-sensing tools, and how they are used, requires careful consideration to ensure that the right tool is used for the right purpose:

- The same approach must be used to identify pre-existing forest cover at year 0 and forest cover attainment (around year 15)
- The tools used to identify forest potential and regeneration progress must be able to detect fine-scale vegetation cover. If different tools are used for each purpose, they should still align to clearly demonstrate that regeneration is progressing towards the goal of attaining forest cover, usually between years 15 and 20. On-ground fieldwork, drone footage and LiDAR data are examples of appropriate approaches used by project proponents to detect fine-scale regeneration as well as the growth of more mature vegetation.

Figure 9 Tools that can be used estimate and monitor regeneration.



A key source of remote-sensing data is the maps that inform the National Inventory, which is continually being improved. As with anything viewed from above, remote-sensing data cannot be used to determine the height of vegetation or the presence of very young, small trees. Because of this, these maps are approved to demonstrate forest cover, but they must not be used as the sole data source for stratifying CEAs (as of 2019) and measuring the regeneration performance of projects. National-scale data sets may be useful to monitor the performance of the whole portfolio of projects once it matures to forest. Field measurement observations conducted by independent auditors and reviewers confirm that CEA stratification by proponents is significantly more accurate than national-scale models.

Remote-sensing data must be supported by regular fieldwork and on-ground monitoring to ensure accurate stratification, re-stratification and measurements of regeneration progress. As technology matures and becomes more cost-effective and accessible, there are opportunities to incorporate this into scheme participation and administration, and can inform the development of future methods.

Evidence and record keeping

Along with collecting and submitting offsets reports, project proponents are also required to keep records, including:

- evidence of the suppressors that existed in the baseline period (the 10 years before the project commencement) for the affected CEAs
- evidence of the HIR activities that were introduced to manage those suppressors
- the type and timing of HIR activities
- dates of any disturbance events to inform and justify any activities proposed or undertaken to restore carbon stock that has been affected by a disturbance event.

Information requirements for HIR projects are outlined in the method, the Carbon Farming Initiative (CFI) Mapping Guidelines and the FullCAM Guidelines. The CER website contains more information about the evidentiary and record-keeping requirements for project proponents.

Crediting controls

Crediting controls ensure that a project's inputs (e.g. area, model points, disturbance events) into FullCAM abatement calculations are continually adjusted to reflect on-ground changes in regeneration, forest potential, management activities and disturbances. This ensures that FullCAM outputs accurately reflect the carbon sequestration on the ground during the relevant reporting period to avoid over-crediting.

Re-stratification

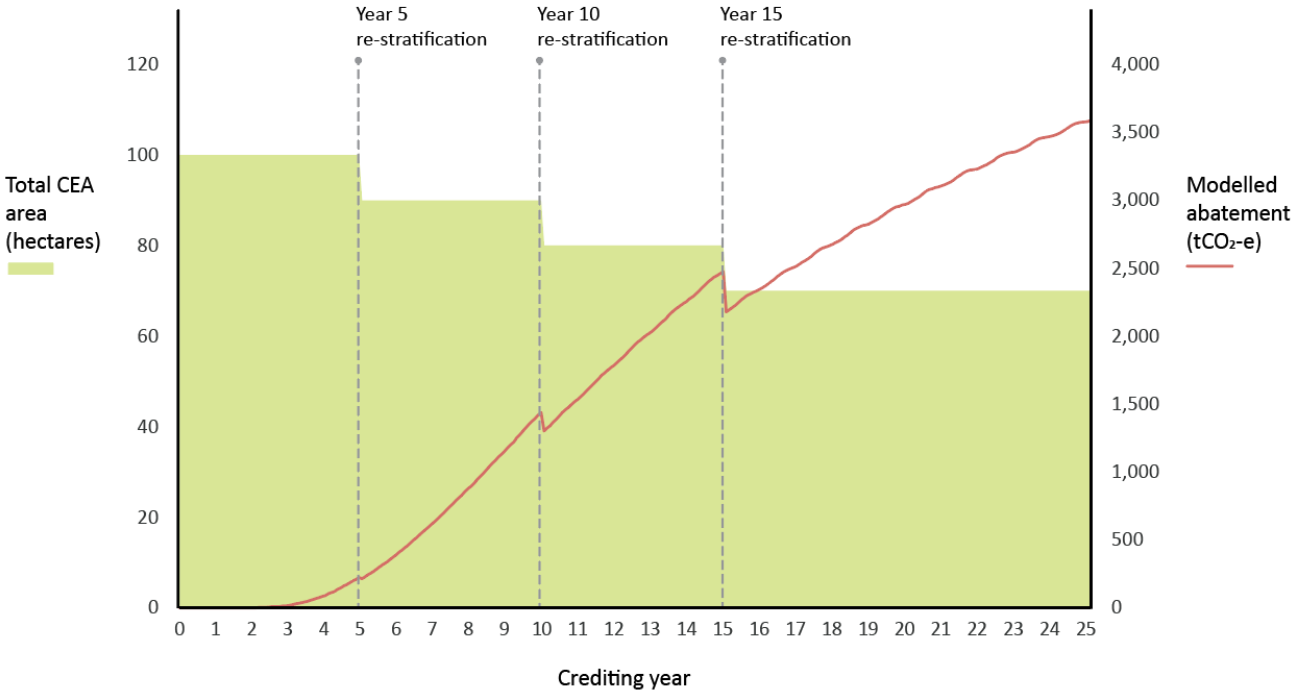
The major control is regular re-stratification, to identify and remove any areas from CEAs that are not performing to the required threshold to attain forest cover, or when events such as bushfire impacts the CEA. Following re-stratification any change in CEAs must be modelled correctly according to FullCAM.

Figure 10 provides an example of how re-stratifications affect the modelled carbon abatement for HIR projects. In this scenario, the project is re-stratified to remove areas that no longer have forest potential from CEAs:

- Year 5 check results in 10% of the initial CEA being removed
- Year 10 check results in a further 10% of the initial CEA being removed
- Year 15 check (forest cover assessment date) results in another 10% of the initial CEA being removed.

By the end of the project, 70% of the initial CEA is eligible for crediting. Carbon sequestration continues to occur to various degrees across parts of the remaining 30% of the initial CEA, along with the wider project area, but this is not monitored or credited.

Figure 10 An example of a project re-stratification scenario showing the relationship between land being removed from CEAs and the reduction in, abatement, resulting in a staggered trend in the cumulative abatement.



Project proponents use a standardised approach to map regenerating vegetation when defining CEAs, and when demonstrating ongoing forest potential and the attainment of forest cover. This approach was developed by the CER in consultation with industry and technical experts and released in 2019 as the Guidelines on stratification, evidence and records for HIR projects. The guidelines also outline expected data collection and evidence to support claims.

Pauses to crediting

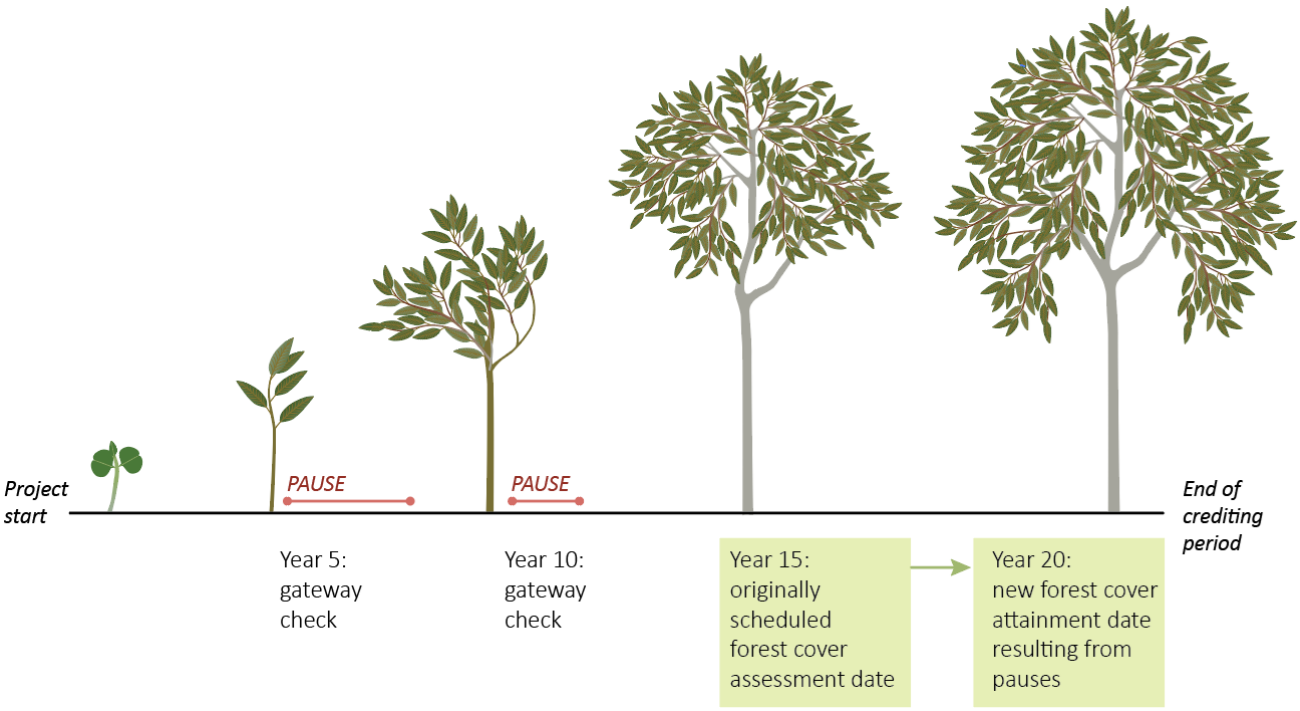
Because ACCUs are issued based on the FullCAM model, unforeseen events and CEA re-stratifications can affect the actual level of regeneration to be credited. The incremental crediting approach includes mechanisms to pause crediting to allow regeneration to 'catch up' to previously credited levels.

A crediting pause may be triggered by 3 different event types:

- A disturbance event (such as a bushfire) impacting carbon stock in a CEA. The disturbance event is modelled in FullCAM to reflect the reduction in carbon stored in that area. If total carbon stocks across the project are less than prior to the disturbance, crediting is paused until regeneration catches up to the level originally modelled
- Land removed from CEAs during the re-stratification process. In these cases, the remaining CEAs continue to regenerate but crediting is paused until carbon stocks in the now smaller CEAs catches up to balance the ACCUs already issued
- A suppression event occurs, such as grazing inhibiting the growth of vegetation, or slower than expected regeneration recovery following a suppression event. This is entered into FullCAM as a *growth pause*. Crediting resumes when the growth pause is removed from FullCAM. Only 5 years of growth pauses are permitted during a crediting period leading to forest cover assessment date.

In all of these scenarios, crediting remains capped to a 25-year period. For example, a 5-year growth pause would extend the forest cover assessment date from year 15 to year 20 (20 years after a project's modelling start date); however, the crediting period is not extended and still ends at year 25 (Figure 11).

Figure 11 A growth pause may delay the period in which a project is required to attain forest cover. In this example, growth pauses applied at year 5 (a 3-year pause) and year 10 (a 2-year pause) will delay the date for when forest cover must be attained by, changing it from year 15 to year 20.



Assessment of evidence

The CER assesses the regeneration evidence provided by project proponents, including re-stratifications and events entered into FullCAM. This process occurs through assessment of offsets reports (including at the regular, mandatory gateway checks) and through independent audits.

Gateway checks

Gateway checks are important milestones for an HIR project to provide assurance to the CER and project proponents. They assure that CEAs continue to meet eligibility and stratification requirements. They also demonstrate whether the project is progressing towards forest cover (gateway checks at approximately years 5 and 10) and has attained forest cover (usually at year 15 but sometimes up to year 20). These checks ensure that ACCUs are only issued for regeneration that occurs on eligible land.

Gateway checks require the project proponent to submit an offsets report with additional information and evidence about project activities and regeneration (over and above the information submitted in offsets reports provided between gateway checks). The CER then assesses the information and evidence included in the report, along with material from a s215 gateway audit associated with the gateway check.

The s215 gateway audit provides an independent conclusion on whether the project proponent has complied, in all material aspects, with the legal requirements of the gateway check. S215 gateway audits are organised and paid for by the CER for an HIR project's regeneration checks and its forest cover attainment gateway check. These audits provide the CER with additional information and evidence to support CER decision making when considering project reports and claims of ACCUs.

The CER must be satisfied that the auditor, or one or more of the audit team's members, has relevant skills and experience in ecological assessment (this is required under the Clean Energy Regulator (Human-Induced Regeneration Projects) Direction 2023).

More information about s215 gateway audits can be found in the CER report, HIR Gateway Audit Requirements.

Independent audits

Independent scheduled audits occur at least 3 times throughout the crediting period of an HIR project. These audits are arranged and paid for by project proponents. These usually happen on-site where the auditor checks project performance against the scheme requirements.

All independent audits must cover:

- accuracy of the measurement of abatement
- operation of the project
- all other matters relating to the establishment and operation of the project in accordance with the *Carbon Credits (Carbon Farming Initiative) Act 2011* and HIR method.

Independent audits usually include fieldwork and site inspections to confirm the implementation of project activities to store carbon and to check record-keeping procedures.

The requirements for registered auditors for the ACCU Scheme are set out in a legal instrument under the *National Greenhouse and Energy Reporting Act 2007*, which requires that auditors:

- have knowledge of scheme legislation (including methods)
- have knowledge of and experience in auditing, including certification in assurance and audit team leadership
- pass the fit and proper person test.

Independent assurance

Gateway checks are regularly reviewed by the independent Associate Professor (Honorary) Cris Brack from the Australian National University. These reviews analyse evidence submitted with offsets reports subject to a regeneration check, independent audits, the CER's assessment, and previous offsets reports to provide additional assurance on the regeneration performance of HIR projects and the broader portfolio. The outcomes also inform compliance responses for specific projects and help improve how the scheme is administered. Review reports are published on the CER website every 6 months.

Remedy actions

If the CER's assessment or the independent audits find that ACCUs have been claimed for areas that do not demonstrate forest potential, the CER will refuse to process the crediting application. The applicant must either demonstrate that the land has forest potential (by providing additional information) or remove the area of land from the CEA. If neither of these occur, the application is refused and no credits are issued.

If the area of land is removed from the CEA, the HIR method takes this into account and crediting will be paused until the remaining regeneration 'catches up' to the level of previously issued ACCUs (see Pauses to crediting). If proponents submit false or misleading information in their offsets reports, the CER can issue an official relinquishment notice for proponents to return the relevant amount of ACCUs.

Relinquishment notices may also be issued for carbon losses, where ACCUs were originally issued for eligible carbon abatement, but the carbon stock is later damaged or destroyed within the permanence period and the proponent failed to take reasonable steps to restore lost carbon. Carbon losses may occur because of fire, or accidental or intentional reintroduction of suppressors.

Expected abatement outcomes

Key points

- The 244 reporting HIR projects could result in around 123 million tCO_2-e to 170 million tCO_2-e/ACCUs by the end of the last projects' crediting period and after scheme crediting discounts).
- Abatement outcomes of HIR projects are affected by many variables, including local weather, climate events and HIR activities. FullCAM considers project-specific parameters to regularly re-estimate abatement outcomes.
- HIR projects result in other sources of abatement that are not credited.

The actual abatement achieved by the portfolio of HIR projects is affected by many variables. To understand the level of carbon sequestration that may be achieved, it is necessary to take account of:

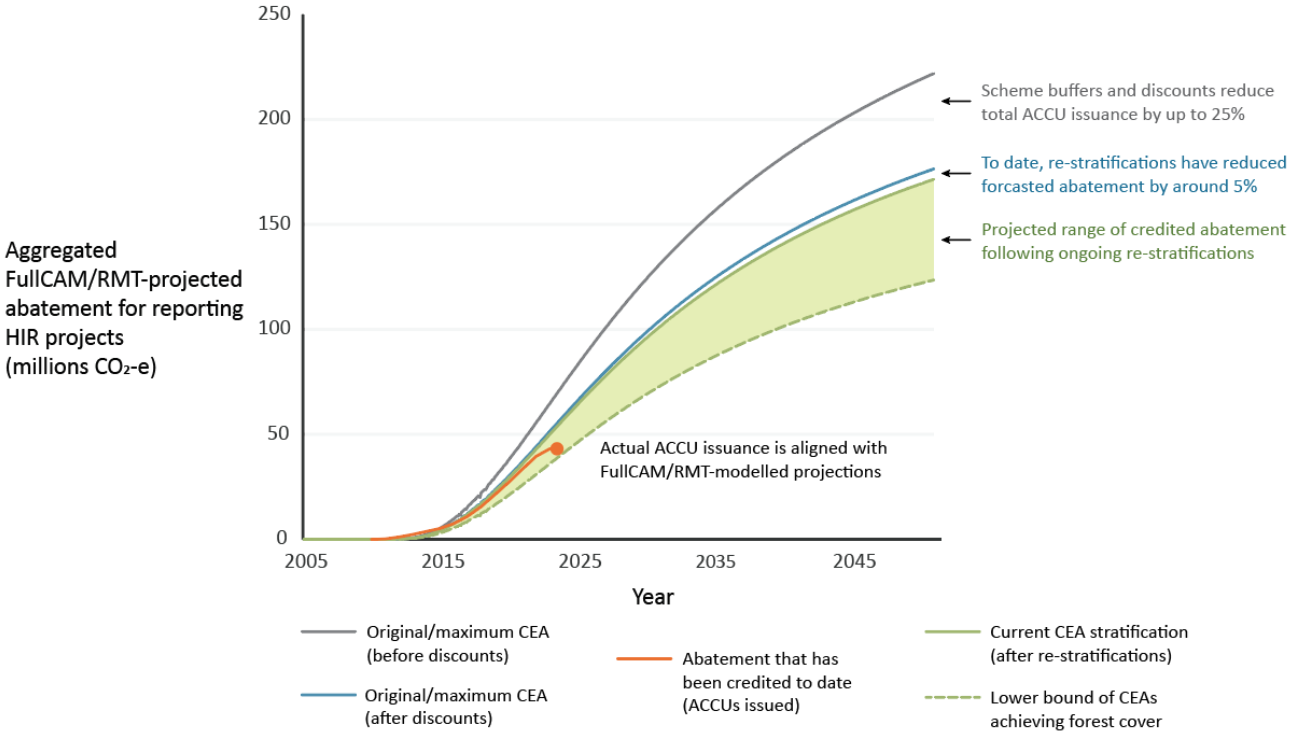
- project start dates (when HIR activities and the crediting period commenced) and modelling start dates (which may occur before a project start date to reflect regeneration underway) because both of these may be different to the date a project was registered
- the area of CEAs at the time of first reporting/initial stratification
- the extent to which CEAs have been re-stratified at reporting periods throughout the project, including at gateway checks
- the frequency and extent of any management activities and disturbance events, including fires and growth pauses
- a set of scenarios that define the range of plausible outcomes of CEA re-stratification through the remainder of project crediting periods
- the expected carbon sequestration, as defined through FullCAM, from the final pool of CEAs that achieve forest cover
- the data sources and approaches that are used by project proponents to identify regeneration and forest within their CEAs, based on locally acquired data and high-resolution satellite imagery.

Current forecast

Based on their maximum extent of CEA stratification for the 244 currently reporting HIR projects (either at initial stratification or a subsequent addition of new areas), the maximum amount of carbon abatement was forecast to be around 220 million tCO_2-e by the end of the last projects' crediting period. Scheme crediting discounts are applied to all sequestration projects which reduces the amount of abatement credited to around 180 million tCO_2-e. After taking account of areas that have already been removed (re-stratified), credited abatement is reduced to 170 million tCO_2-e. When accounting for further re-stratifications that are expected to occur over the life of these projects, a conservative range of between 123 million tCO_2-e to 170 million tCO_2-e (or 123-170 million ACCUs) is expected.

The remaining 223 projects that are yet to report and are not included in this forecast and will progressively add to the portfolio of ACCUs credited through the HIR method. The CER will continue to track the progress of the whole portfolio over time.

Figure 12 Total carbon abatement forecast scenarios for aggregated reporting HIR projects until the end of the last project's crediting period, as at May 2024.



Uncredited abatement

HIR projects result in other sources of abatement that are not credited. Regeneration often occurs outside of CEAs because of the changes to land management at the property scale. Additional sources of uncredited abatement also occur as a result of the regulatory changes introduced after the 2018 and 2019 CFI Rule amendments, which introduced regeneration checks and attainment of forest cover requirements.

The uncredited sources of abatement that may occur as a result of an HIR project may include:

- areas consisting of pre-existing forest in a project area that continue to grow and sequester carbon throughout the crediting period
- areas identified as not having forest potential within the property – for example, because they were not identified earlier by the project proponent, but nevertheless regenerate and sequester carbon to some extent
- any areas that have forest potential but are less than 0.2 ha in area and as such are excluded from a CEA
- any regeneration that occurs within CEAs before project start dates (initial carbon stock)
- any areas that are ineligible under the CFI Rule (for examples, areas that were cleared in the seven years prior to registration, but nevertheless regenerate as a result of project activities
- areas that were identified as having forest potential and stratified in CEAs, but subsequently did not demonstrate sufficient regeneration to meet crediting requirements (such as not meeting HIR gateway requirements or not attaining forest cover by year 15), but nevertheless sequester carbon and potentially reach forest cover over longer timescales
- areas that were identified as having forest potential and stratified in CEAs, but subsequently were subject to disturbance events and lose forest potential but continue to sequester carbon after the event and potentially reach forest cover over longer timescales

- other carbon pools, such as soil carbon, that sequester carbon during the crediting period as a result of HIR activities but are not measured or credited
- regeneration that continues after the end of a project's crediting period.

The conservative approach to crediting in the HIR method means that by the end of the crediting period projects typically end up being credited for a smaller area than the initial CEA that was stratified (see Carbon estimation areas evolve to respond to changes in forest potential).

Appendix A – Independent analysis conducted by the CSIRO to verify that FullCAM predictions are consistent with total ACCU issuance

Methods

Verifying that total ACCUs issued are consistent with FullCAM model expectations requires simulating the model-predicted abatement, less the 5% risk of reversal discount, for each of the 244 HIR projects that had received credits as at May 2024. For those projects electing a 25-year permanence period, a further discount of 20% also needs to be applied.

Across the 244 projects, 70 were simulated using the Reforestation Modelling Tool (RMT) variant of FullCAM; 167 projects were simulated using the 2016 version of FullCAM; and 7 projects were simulated using the 2020 version of FullCAM (with the per-project model version assignments provided to CSIRO by the CER). Across the 244 projects, 144 (or 59%) had elected to adopt a 25-year permanence period, with the balance of projects adopting a 100-year permanence period.

Eligible abatement under HIR includes all above- and below-ground, living and dead woody biomass. Rather than use the FullCAM software to calculate abatement, which would require manually entering the input data into the model interface for each project separately, the FullCAM Tree Yield Formula (TYF), which predicts changes in above-ground living biomass over time, was coded in a separate program. Expansion of above-ground biomass to below-ground biomass and total dead biomass was achieved by applying model-specific expansion factors. Differences in predictions between the 3 FullCAM variants arise from differences in 2 key growth parameters, *G* (the age at which biomass accumulation is maximum) and *M* (the maximum above-ground biomass that the modelled location is predicted to support) (Table 2).

Table 2. Key variables controlling the rate and magnitude of biomass accumulation in FullCAM. G is the age at which biomass accumulation is maximum; r is a growth multiplier and is set to 1.0 for all HIR project calculations; M is the maximum above-ground biomass that the modelled location is predicted to support, and varies spatially at a resolution of 0.0025 degrees (or approximately 250 m).

Model	G (years)	*r*	*M* (t dry matter ha^{-1})
FullCAM 2020	12.53	1.0	Spatially variable parameter[1]
FullCAM 2016	10.0	1.0	Spatially variable parameter[2]
RMT	10.0	1.0	Spatially variable parameter[2]

[1]Available for download at Site potential (M) and FPI average versions 2.0 | Resources | data.gov.au - beta

[2]Available for download at Site potential (M), ratio, FPI avg versions 1.0 | Resources | data.gov.au - beta

Project-level model settings and assumptions

Simulating total abatement for each of the 244 projects required access to a range of project-level information. Some of this information was publicly available from the project and contract registers, whereas other information (such as the model start dates) were provided to CSIRO by the CER.

The key information to undertake a simulation, for a single project, included:

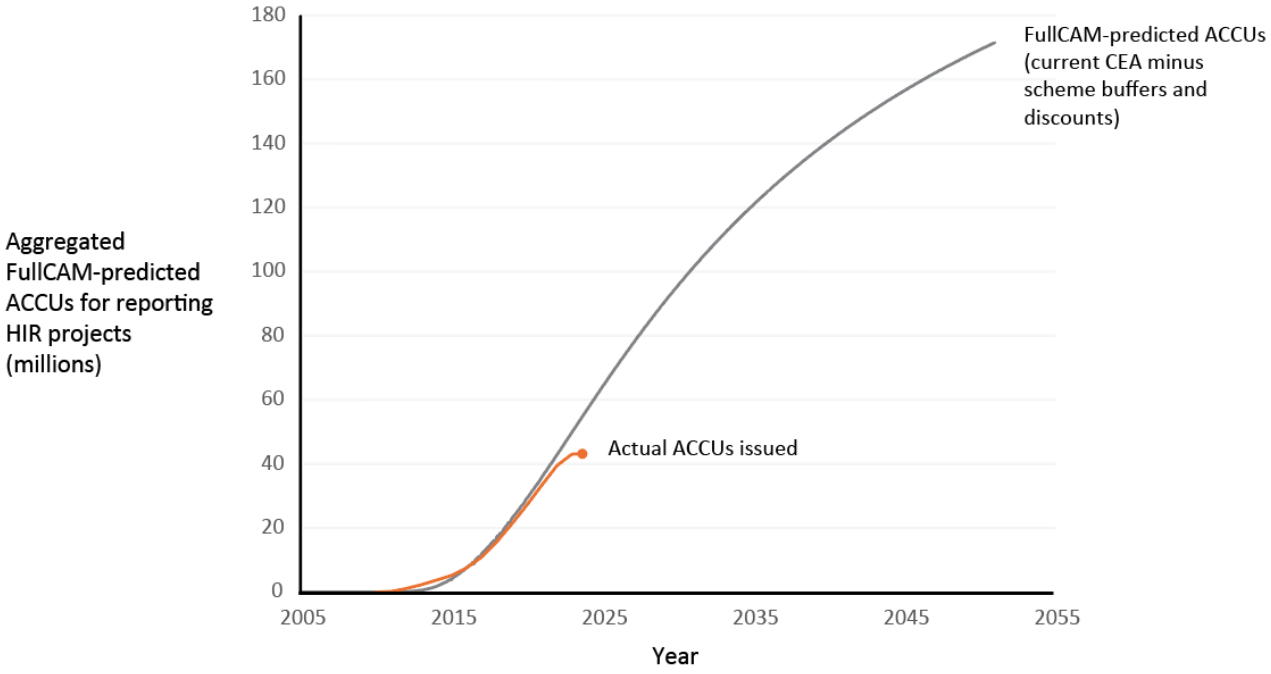
- Project location. A simplifying assumption was made to simulate only one model point per project (rather than one model point per CEA). This point was selected to have a value of *M* that was representative (that is, close to the average) of the range of *M* values across all CEAs within the project.
- The modelling start date was set as specified from the project records (provided to CSIRO by the CER).
- Simulations were run until 2050 across all projects.
- Per-project total CEA area was provided to CSIRO by the CER.
- Carbon content for both living and dead biomass was assumed to be 0.47.
- Carbon mass was converted to CO_2-e by multiplying by 44/12.
- In FullCAM, annual growth increments are scaled using the current years Forest Productivity Index (FPI). For the analyses reported here average climatic conditions were assumed, and hence annual variations in growth increment due to year-to-year climatic variability were not included.
- The HIR methodology allows for user-defined growth pauses, to reflect periods of non-growth due to, for example, the temporary action of a growth suppressing factor. For these simulations no growth pauses were applied.
- Emissions from any fire activity within projects were excluded.

Additionally, the total per-project ACCUs that had been issued, and the last reporting date for each project, were provided by the CER to facilitate comparison with the model predictions.

Results

Discrepancies between FullCAM model predictions and the time-course of ACCU issuance are expected, given ACCU issuance dates are not exactly aligned with the model-predicted timeseries of abatement, and the simplifying assumptions notes above, especially the decisions to represent each project by a single model point, and to use average rather than annually-varying climate. Despite this, comparing the model predictions to total ACCUs issued indicates close agreement with FullCAM forecasts, providing confidence in the reporting and issuance mechanisms currently in place (Figure 13).

Figure 13 The time-course of FullCAM-predicted ACCUs aggregated over 244 HIR projects compared with ACCUs issued by the Clean Energy Regulator.



Appendix B – Independent reviews of the ACCU Scheme and HIR method, and relevant legislation and publications

Multiple reviews have confirmed the integrity of the ACCU Scheme and HIR method:

- The Emissions Reduction Assurance Committee (ERAC) reviewed the HIR and NFMR methods in 2019 and found them to meet the offset integrity standards after the forest cover attainment rule and associated processes were introduced.
- The 2022 Independent review of Australian carbon credit units (known as the Chubb Review) found the HIR method is sound – it meets the offsets integrity standards and is administered by a robust regulatory framework.
- In 2022, the ERAC commissioned an independent, peer-reviewed statistical analysis by Profs. Stephen Beare and Ray Chambers that found that HIR projects have a significant increase in vegetation when compared to similar land without a project (the 'counterfactual').
- The CER engaged the services of Associate Professor (Honorary) Cris Brack, a forestry expert from the Australian National University, to review the performance of individual HIR projects passing their first 5-yearly regeneration check. Associate Professor Brack found HIR projects are demonstrating regeneration and proponents are implementing the project activities. In addition, the independent audit reports and the CER's assessment of HIR projects provide strong assurance that projects meet the requirements of the method.
- The Climate Change Authority's review (December 2023) found the ACCU Scheme is fundamentally well designed.
- The Australian National Audit Office's (ANAO) 2023–24 performance audit report 'Issuing, compliance and contracting of Australian Carbon Credit Units (ACCUs)' found the CER's administration of the ACCU Scheme is effective or largely effective.

ERAC reviewed the HIR method in 2018. Based on this review, amendments to the CFI Rule in 2018 and again in 2019, along with the *Guidelines on stratification, evidence and records* published in 2019, aimed to better define the method and processes.

The amendments:

- require that the data sources and data processing approaches used by project proponents are approved by the CER, including demonstrating that a CEA has attained forest cover (where attainment is not demonstrated by the most recent version of maps that form the basis of the National Inventory Report)
- ensure consistency between approaches and sources used to identify both pre-existing forest cover and forest cover for the purposes of satisfying requirements relating to the attainment of forest cover
- require project proponents to apply consistent procedures (including consistent data sources and processing) to support both exclusion of pre-existing forest cover and attainment of forest cover – a consistent approach ensures there is no bias towards a data source that detects relatively less or more forest cover to suit the objective
- require the 0.2 hectare portions of a CEA be assessed with data sources and data processing approaches that are the same as, or equivalent to, those used to demonstrate that the CEA did not have any pre-existing forest cover
- provide that, where use of the same data sources and data processing is no longer possible, the ones used must be consistent with, or comparable to, the previously used data sources and data processing approaches.

Relevant legislation and publications include:

- The *Carbon Credits (Carbon Farming Initiative) Act 2011* (the CFI Act) is the primary legislation that governs the ACCU Scheme in Australia.
- The Carbon Credits (Carbon Farming Initiative) Rule 2015 (the CFI Rule) is a supplementary piece of legislation to the CFI Act.
- The Carbon Credits (Carbon Farming Initiative) (Human-Induced Regeneration of a Permanent Even-Aged Native Forest—1.1) Methodology Determination 2013 is the HIR method legislation. All HIR projects are registered under the original legislation or one of three updates to the method.
- The *Clean Energy Regulator (Human-Induced Regeneration Projects) Direction 2023*, which sets out how the CER implements recommendation 8 of the Final Report of the Independent Review of ACCUs. Under the Direction, the CER will prioritise audits under section 215 of the CFI Act for the compliance of HIR projects submitting offsets reports subject to gateway checks.
- HIR Audit Gateway Requirements sets out the approach the CER will take to CFI Act section 215 gateway audits for HIR projects. Gateway audits were introduced in May 2023 following the Direction from the Minister for Climate Change and Energy to the CER concerning the administration of HIR projects.
- ACCU Review Recommendation 8: HIR Implementation outlines the approach CER takes to implementing ACCU Review Recommendation 8, including information and evidence requirements for best practice reporting.
- ACCU Scheme Compliance and Assurance Framework outlines the CER's compliance and assurance approach for the ACCU Scheme.
- FullCAM Guidelines for the HIR Method (2020), from the former Department of Industry, Science, Energy and Resources, outlines requirements for using the FullCAM within the ACCU Scheme
- Carbon Farming Initiative (CFI) Mapping Guidelines (2018) are designed to complement the law set out in the CFI Act and CFI Rules. The guidelines are designed to be used by project proponents.

Guidance on the HIR method and the ACCU Scheme is available in the ACCU Scheme Guidance library on the CER website.

Appendix C – Summary of physical and administrative risks and controls

A summary of key physical and administrative risks is provided in Tables 3 and 4.

Table 3 Key physical risks, their causes, requirements for crediting, and controls to prevent over-crediting.

Physical risks	Possible causes	Requirement for crediting	Controls to prevent over-crediting
Forest cover is not achieved, which can lead to over-crediting	• Forest potential is not appropriately identified at initial stratification (including accurately identifying biophysical conditions and species mix) • Loss of ecological resilience from long-term degradation associated with suppressors • Removal of suppressors is not sufficient to secure recruitment and growth of vegetation • Management is inadequate and not effective • Climate variability impedes growth (drought) • Climate change shifts range of ecological community	Progressive gateway checks: • Initial stratification (6 months to 5 years) – 5% canopy cover at 1,000–200 ha scale • 5-year re-stratification – 7.5% canopy cover at 100 ha scale or 5% increase in canopy cover over 5 years • 10-year re-stratification – 10% canopy cover at 10 ha scale or 5% increase in canopy cover over 5 years • 15-year re-stratification – 90% of each CEA has forest cover (20% canopy cover at 0.2 ha scale)	• Carbon estimation areas must be stratified in accordance with the rules, including using appropriate systems and processes to detect regenerating vegetation (e.g. remote-sensing imagery, machine-learning and field data). This provides evidence of forest potential so that only eligible land is credited. • Ongoing requirement for the project proponent to monitor CEAs for areas that no longer have forest potential (e.g. due to a disturbance event) so that these can be removed and not credited. • Multiple layers of assurance to confirm regeneration and eligibility of land in CEAs (CER assessment, independent audits and experts reviews, including GIS analysis and site visits). • Incremental crediting to respond to re-stratified CEAs (ACCUs are only issued as regeneration is evidenced and carbon sequestration is achieved). • Modelled growth pauses in FullCAM where there is evidence that suppressors have disrupted regeneration (growth pauses can be for up to 5 years during the crediting period to allow regeneration to 'catch up' to the forecasted level of abatement and resulting ACCUs).

Physical risks	Possible causes	Requirement for crediting	Controls to prevent over-crediting
			• Carbon estimation areas re-stratified to remove areas that are not on track to attain forest potential. This is an ongoing requirement, with additional requirements at 5-yearly gateway checks at years 5, 10, with forest attainment checks usually during years 15 and 20. • Crediting pauses where ACCUs have already been issued for ineligible land identified through re-stratification
Loss of vegetation due to disturbance, which can disrupt progress and the crediting timeline	• Fire • Storm • Extended drought • Accidental or intentional incursion of prior or new suppressors (mechanical or chemical clearing, grazing, feral animals)	• Forest cover must be sustained for the full permanence period • Project proponent must demonstrate they have taken reasonable steps to protect carbon stock from suppressors and other physical risks	• Ongoing requirement for project proponent to monitor project for areas impacted by disturbance events, so that these areas can be removed from CEAs, or established as separates CEAs to be modelled according to the new attributes of the land. • Multiple layers of assurance to confirm regeneration and eligibility of land in CEAs (CER assessment, independent audits and experts reviews, including GIS analysis and site visits). • Scheme-wide buffer for sequestration projects (5%) acts as an insurance to balance carbon losses from disturbance events. • Permanence buffer (20% for 25-year permanence period) acts as an insurance to balance carbon losses from disturbance events. • Modelled growth pauses in FullCAM where there is evidence that a disturbance event has caused carbon losses (pauses can be for up to 5 years during the crediting period to allow regeneration to 'catch up' to the forecasted level of abatement and resulting ACCUs)

Physical risks	Possible causes	Requirement for crediting	Controls to prevent over-crediting
			• Permanence plans (actions to be or being taken to mitigate against the risk of disturbance events) must be prepared and reported to the CER throughout the crediting period. • Requirement to restore carbon stock back to level credited or remove area and either pause crediting or return ACCUs. • Official relinquishment notice from the CER may be issued in response to unmitigated carbon losses. • Carbon Maintenance Obligation from the CER may be issued on the land that requires action to protect or restore carbon stock to previous levels for which they have received ACCUs.

Table 4 Key administrative risks, their causes, requirements for crediting, and controls to prevent over-crediting.

Administrative risks	Potential causes	Requirements for crediting	Controls to prevent over-crediting
Model is not applied to the correct parts of the project area, leading to over-crediting or under-crediting	• Model is applied to ineligible areas of land (e.g. land that does not have forest potential) • Model is not applied to eligible areas of land (areas with forest potential are excluded) • Model is applied inappropriately by project proponents (e.g. the wrong inputs are used)	Use appropriate tools to stratify and re-stratify CEAs to inform which parts of the project area the model should be applied to	• Conservativeness built into the method: two-thirds of a project area is generally excluded and not credited despite a reasonable expectation to sequester carbon – this is because sequestration in these areas is not expected to occur to the required threshold. • Ongoing review and re-stratification of CEA to narrow the application of the model to only eligible land within the project area. • Model any relevant disturbance events (such as grazing or fire) to ensure that the model outputs accurately reflect current carbon stocks. • Model points must represent eligible land as per the most recent stratification. • Other sources of carbon sequestration, such as soil and baseline forest cover, are not accounted for in abatement calculations. • Total credits are reduced by 5% (risk of reversal buffer for all projects) and 20% (permanence discount for 25-year projects).
Project stratification not accurate, leading to inaccurate	• Poorly trained remote-sensing and machine-learning models • Inadequate field data	• Compliance with the method requirements • Compliance with the Guidelines on stratification and evidence	• Models are developed according to the Guidelines on stratification and evidence records for HIR and native forest from managed regrowth (NFMR) projects. They are informed by fit-for-purpose remote-sensing data and developed using a robust set of training, test and validation data obtained within the project area. Minimum accuracy requirements apply with

Administrative risks	Potential causes	Requirements for crediting	Controls to prevent over-crediting
model application (see above)	• Reliance on a single data source • Inconsistent approach to identify pre-existing forest cover and forest attainment	records for HIR and NFMR projects • Progressive gateway checks require information that the boundaries and stratification of CEAs meet the requirements of the method	respect to the classification of forest cover and forest potential. • Multiple layers of assurance throughout a project, including the CER's assessment of data sources and approaches used by projects, independent audits and expert reviews. Audits and reviews include GIS analysis and site visits to ensure CEAs have been appropriately stratified in accordance with the requirements of the method and guidelines. • The CER can request additional information and evidence; require changes to the stratification so that ACCUs can be issued appropriately; and refuse an application for ACCUs if it is not satisfied with the model used by a project to stratify its CEAs. • Re-stratification of carbon estimation areas to remove areas that no longer have forest potential. This occurs regularly throughout a project, with a minimum of a re-stratification at each 5-yearly gateway check (5, 10 and 15 years).
Inaccurate reporting of regeneration and HIR activities	• Accidental or intentional errors in offsets reports • Missing evidence and records to support report claims	• Offsets reports. • Record keeping	• The CER verifies offsets reports against multiple lines of evidence • Gateway checks at years 5, 10, with forest attainment checks usually at year 15 or 20 • S215 audits • Independent audits • In extreme cases, a project can be removed from the scheme if the proponent has provided false or misleading information.